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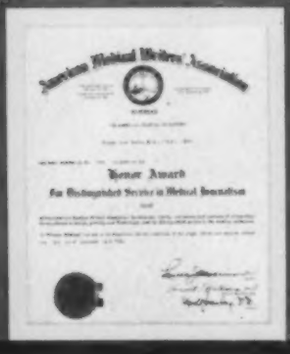
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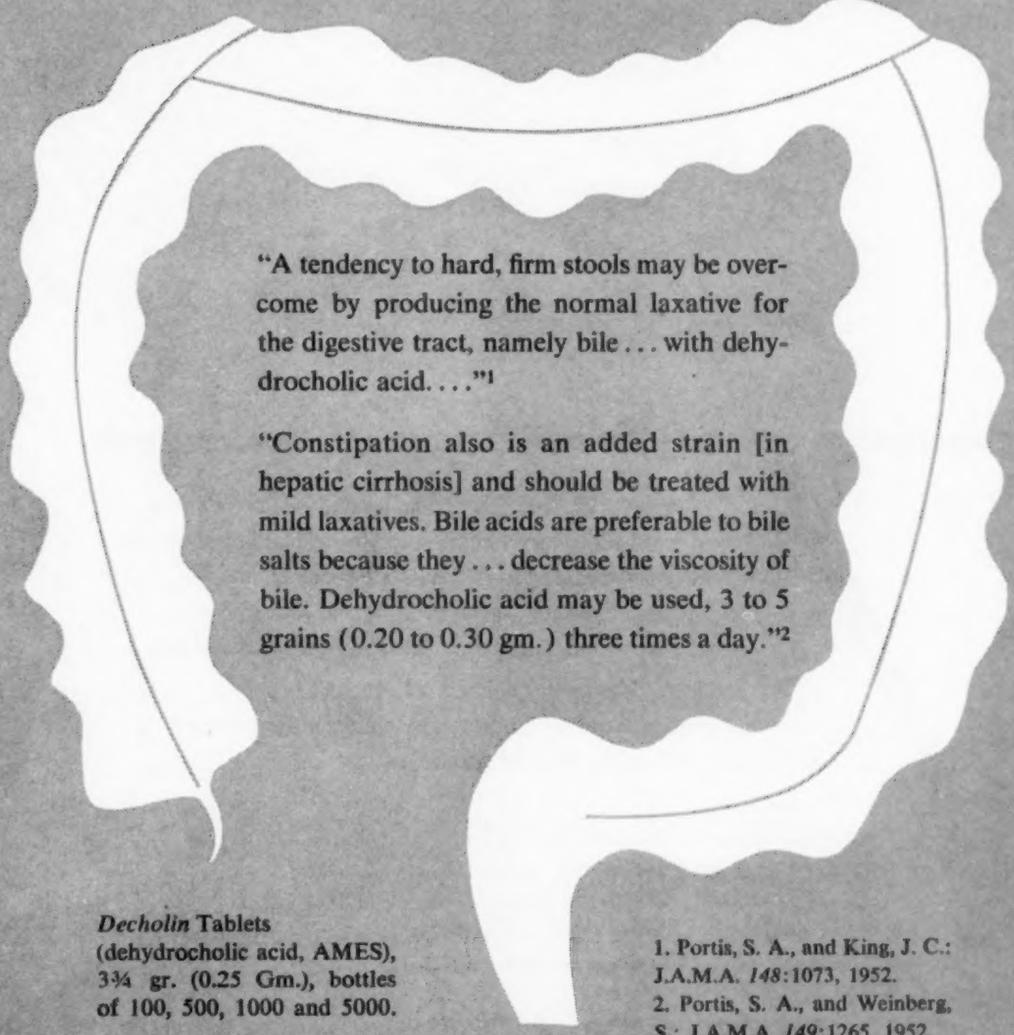

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The American Journal of Surgery

VOL. LXXXVI — Contents • November, 1953 — NUMBER FIVE

Papers of the Scientific Sessions

ORIGIN AND MANAGEMENT OF CANCER OF THE COLON AND RECTUM . *Frank H. Lahey* 489

PRIMARY ABDOMINAL WOUND HEALING IN SURGERY INVOLVING THE COLON . . . . *James A. Ferguson* 494

CLASSIFICATION AND TREATMENT OF CHILDREN WITH SEVERE CHRONIC CONSTIPATION . . *Orvar Swenson* 497

GENETIC FACTOR OF FAMILIAL DISSEMINATED POLYPOSIS COLI . . *Robert Tobin McCarty* 500

TRANSITION PERIOD IN PROCTOLOGY . . . . . *Louis E. Moon* 505

ROENTGENOLOGIC EXAMINATION OF THE BLEEDING BOWEL . . . . *William M. Kitchen* 511

TRAUMATIC PERFORATIONS OF THE RECTUM AND DISTAL COLON . . . . . *Russell R. Klein and Robert A. Scarborough* 515

COLLECTIVE REVIEW OF CANCER OF THE COLON AND RECTUM IN A GENERAL HOSPITAL . *Guy L. Kratzer* 523

ANALYSIS OF CAUSES OF MORBIDITY AND MORTALITY IN COLONIC SURGERY. . . . . *Andrew J. McAdams* 530

VILLOUS TUMORS OF THE RECTUM BELOW THE PERITONEAL REFLECTION . *James E. Ryan* 535

VILLOUS TUMORS OF THE RECTUM AND SIGMOID COLON ABOVE THE PERITONEAL REFLECTION *Marvin A. Lucas* 539

Contents Continued on Page 5

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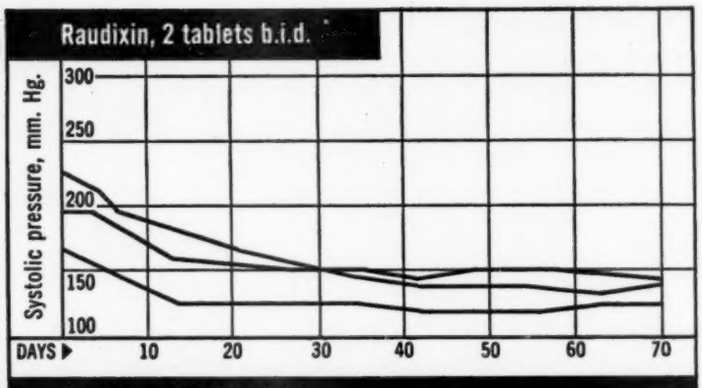

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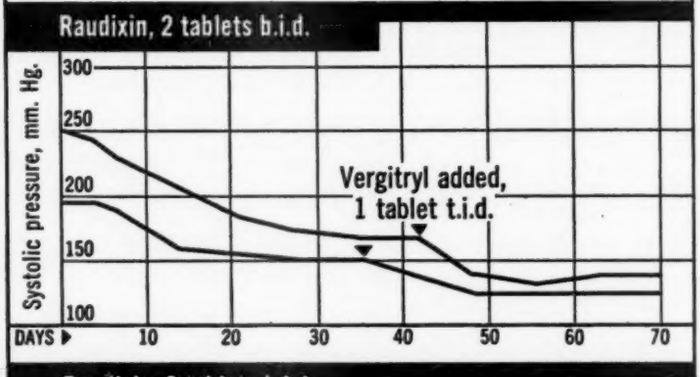

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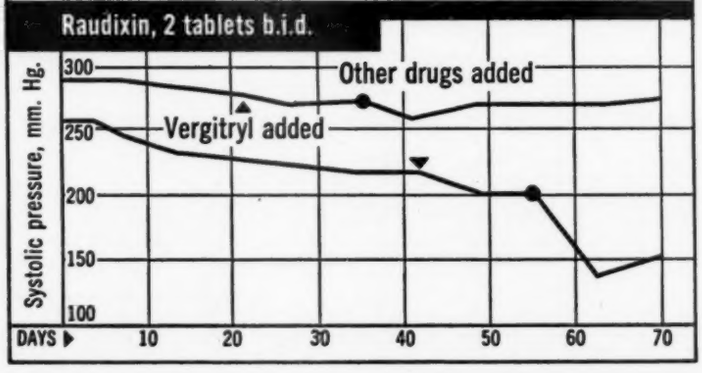

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VOL. LXXXVI — NUMBER FIVE

Contents • November, 1953

SURGERY OF DIVERTICULITIS OF THE COLON . . . . . *Arthur W. Allen* 545

ACCIDENTAL VACCINATION ABOUT THE ANUS. CASE REPORT . . . . *Joseph Berkowitz* 549

PAGET'S DISEASE OF THE ANUS. CASE REPORT . *Lyman R. Pearson and Bruce A. McArt* 551

MULTIPLE CARCINOID OF THE RECTUM. CASE REPORT . . . . . *D. H. Saxe* 553

ADENO-ACANTHOMA OF THE RECTUM. CASE REPORT . . . . . *Naaman Steinberg* 556

CARCINOMA ASSOCIATED WITH ANORECTAL FISTULA . . . . . *J. Milton Stockman and Vincent T. Young* 560

PRESENT STATUS OF THE TREATMENT OF PILONIDAL SINUS DISEASE . . . . . *Neil W. Swinton and R. Kent Markee* 562

SIGNIFICANCE OF URETERAL STUDIES IN COLONIC AND RECTAL SURGERY . . . . . *Harry E. Bacon, Edward J. Lowell, Jr. and Howard D. Trimpi* 572

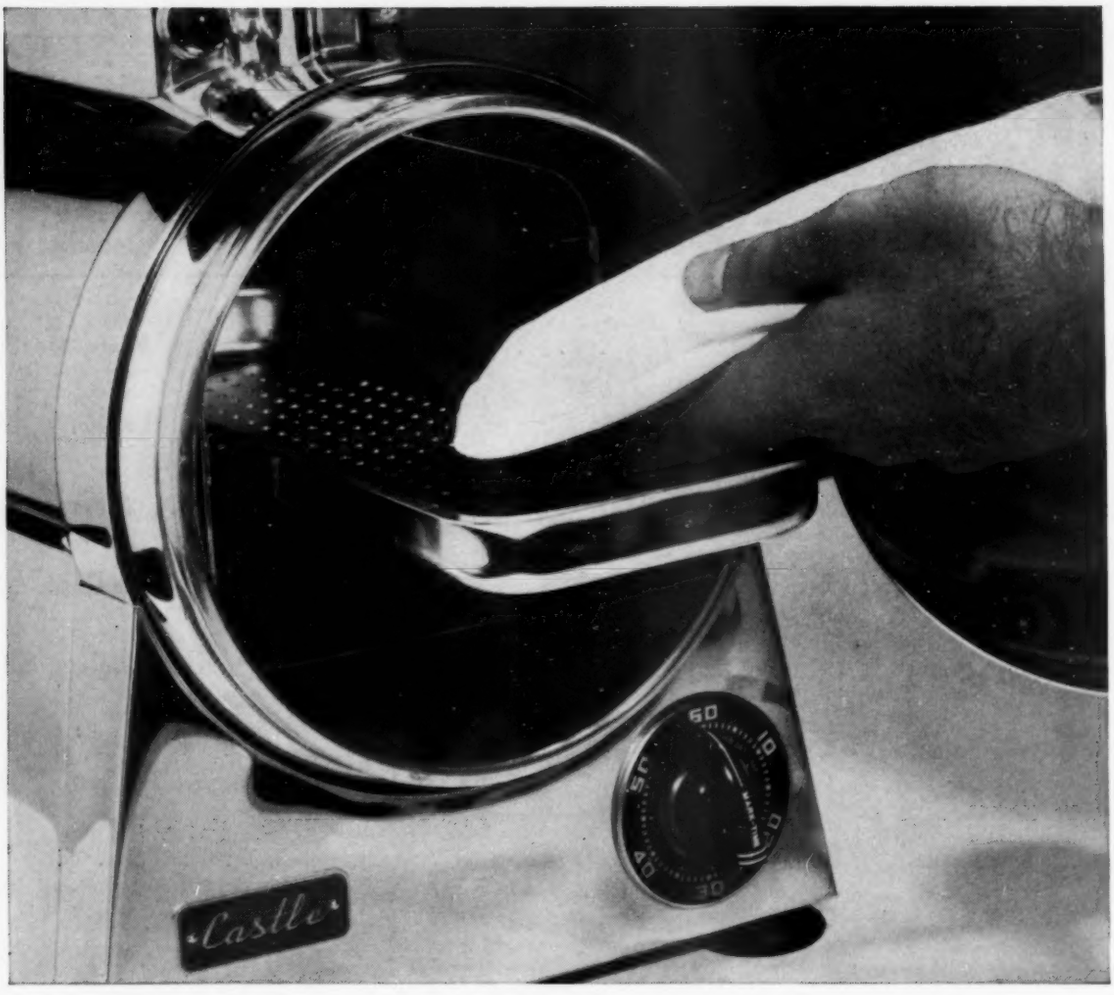
POLYPS OF THE RECTUM AND COLON IN CHILDREN . . . . . *J. Wade Harris* 577

THIERSCH'S OPERATION FOR ANAL INCONTINENCE AND MINOR DEGREES OF RECTAL PROLAPSE . . . . . *William B. Gabriel* 583

AN INVESTIGATION INTO THE EFFECTS OF ALTERED ACID-BASE EQUILIBRIUM UPON THE MOTILITY OF THE COLON . . . . . *P. M. Recio and M. J. Oppenheimer* 591

SURGICAL TREATMENT OF PROCIDENTIA OF THE RECTUM. AN EVALUATION OF COMBINED ABDOMINAL AND PERINEAL REPAIR . . . . . *J. Englebert Dunphy, Thomas W. Botsford and Edwin Savlov* 605

Contents Continued on Page 7



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VOL. LXXXVI — Contents • November, 1953 — NUMBER FIVE

Symposium on Ulcerative Colitis

MEDICAL ASPECTS OF CHRONIC ULCERATIVE COLITIS . . . . . *Chester M. Jones* 608

SURGICAL ASPECTS OF CHRONIC ULCERATIVE COLITIS . . . . . *Richard B. Cattell* 613

MANAGEMENT OF THE ILEOSTOMY . . . . . *Rupert B. Turnbull, Jr.* 617

DISCUSSION OF SYMPOSIUM ON CHRONIC NON-SPECIFIC ULCERATIVE COLITIS . . . . . *Leland S. McKittrick* 625

Papers Read by Title

A STUDY OF THE EFFECT OF TERRAMYCIN ON THE INTESTINAL FLORA. WITH SPECIAL REFERENCE TO THE ACCOMPANYING SIDE EFFECTS . . . . . *Ralph F. Allen* 628

PLASTIC TREATMENT OF HIDRADENITIS SUPPURATIVA OF THE BUTTOCK . *Enrique Figares* 632

CAUDAL ANESTHESIA FOR ANORECTAL SURGERY . . . . . *Maurice M. Rosenbaum* 636

FISTULA-IN-ANO IN INFANTS . . . . . *Ralph C. Venturo* 641

Advertising Index on 3rd Cover

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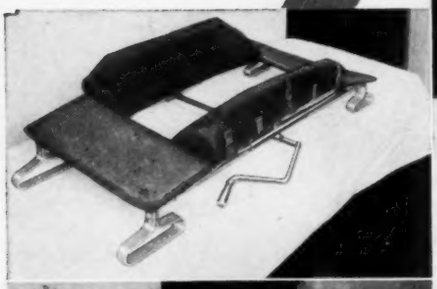

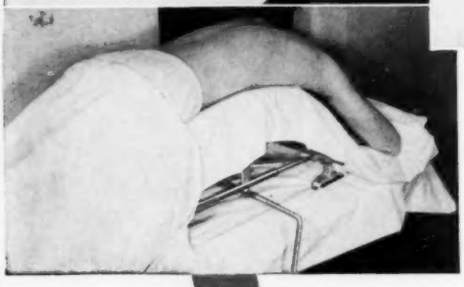

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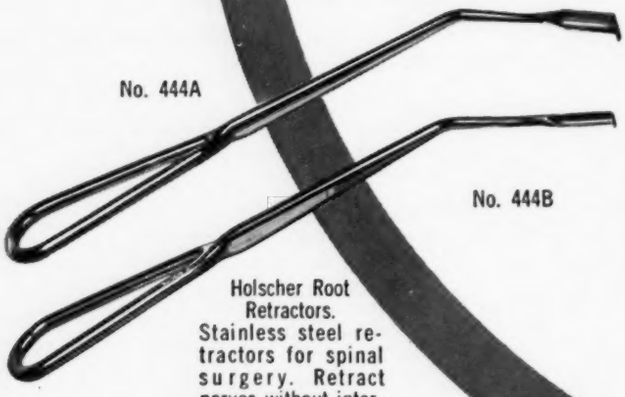

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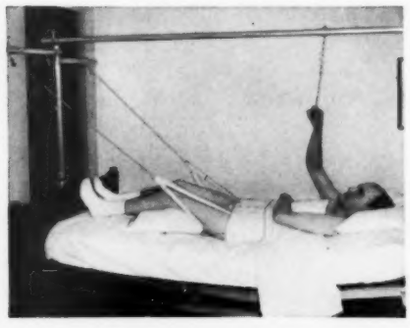

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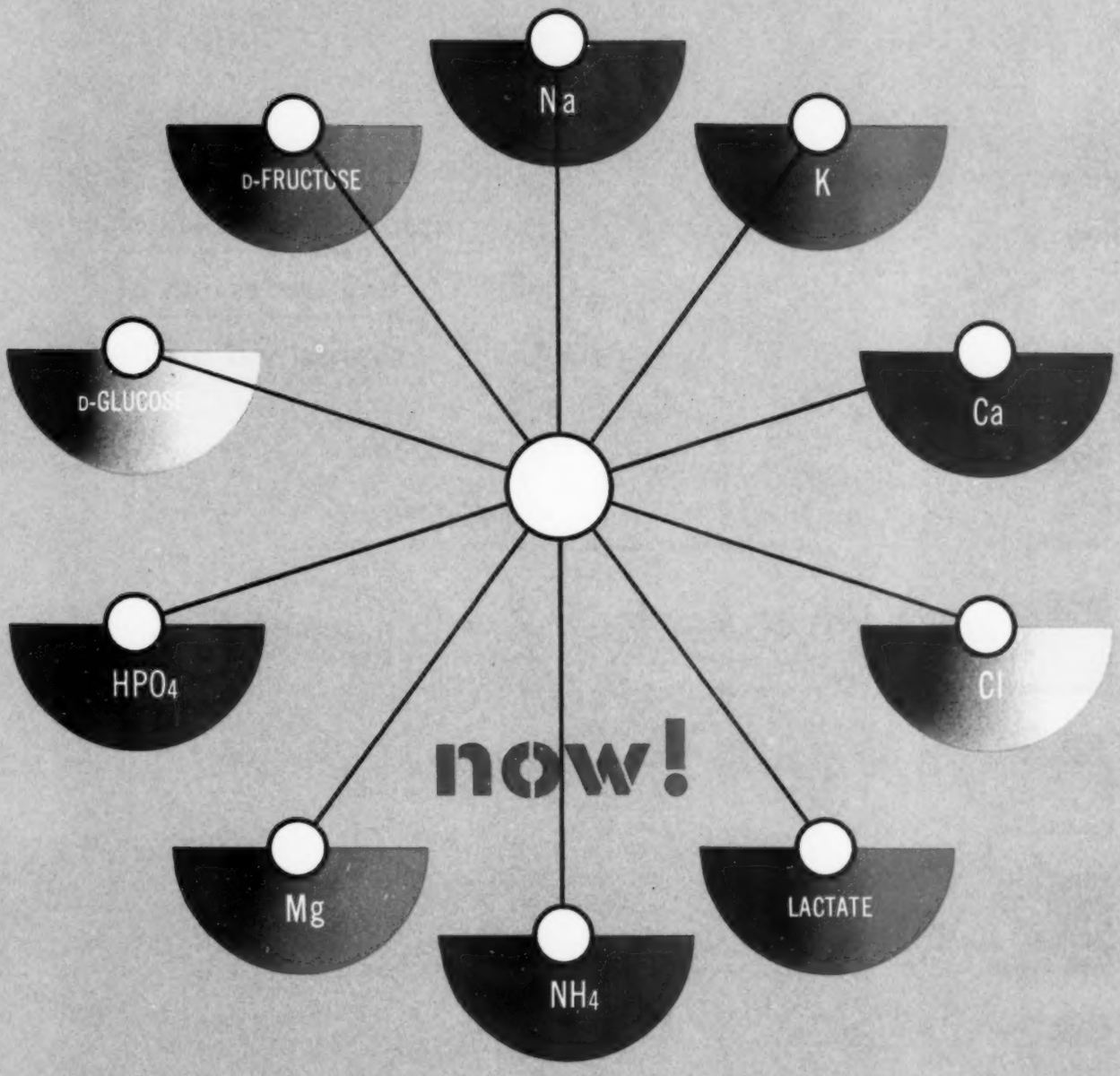

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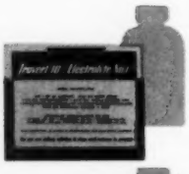

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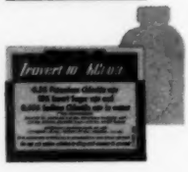

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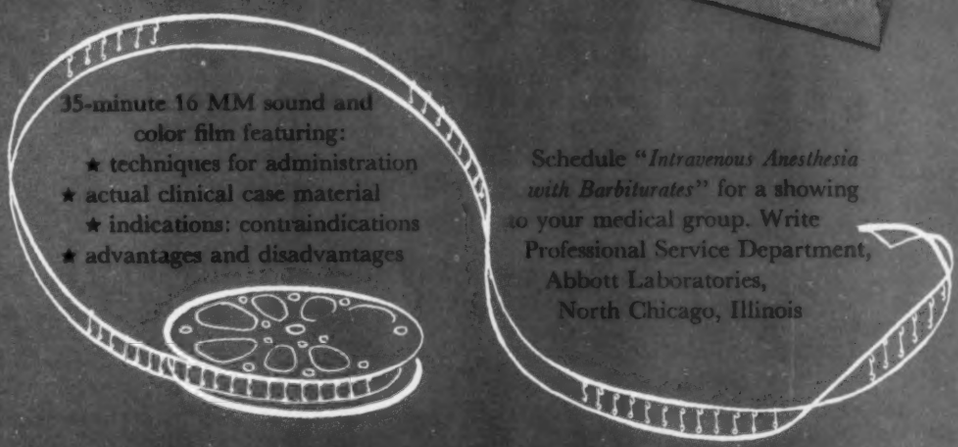

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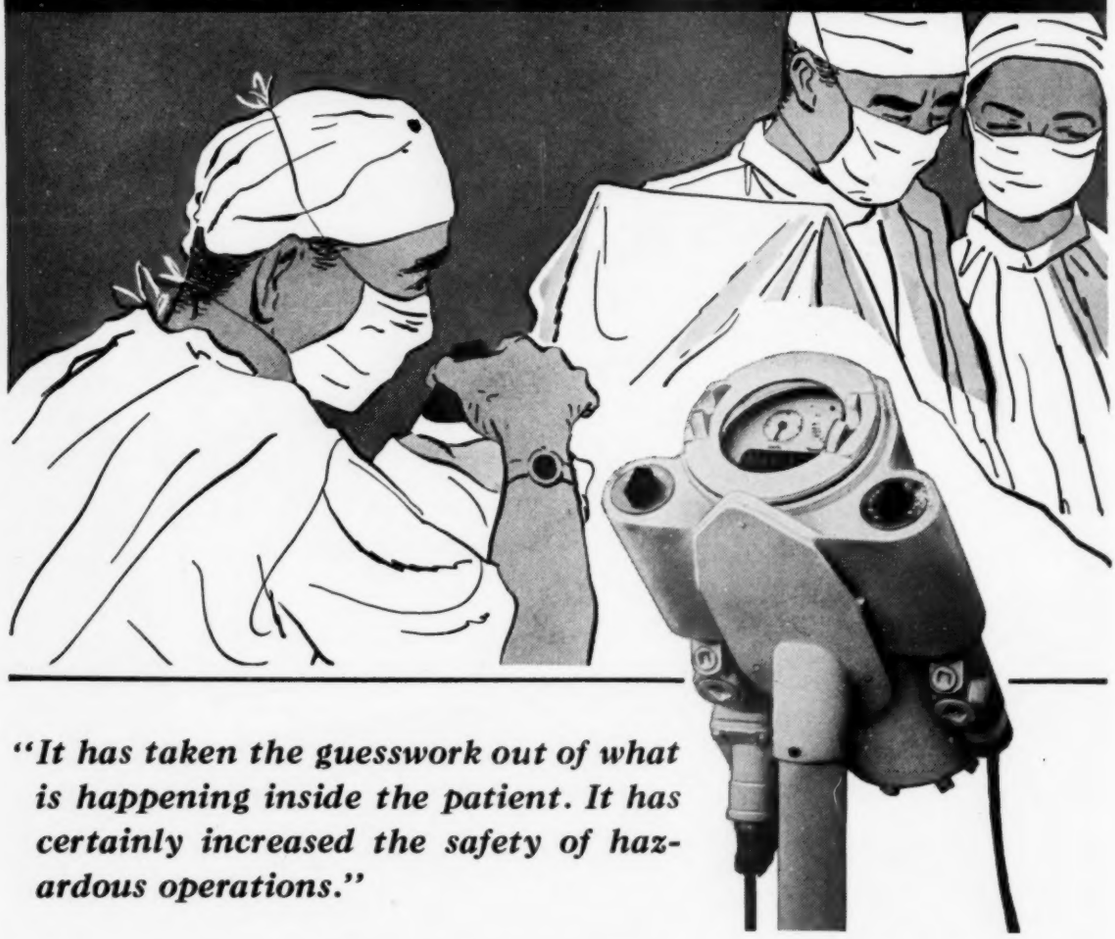

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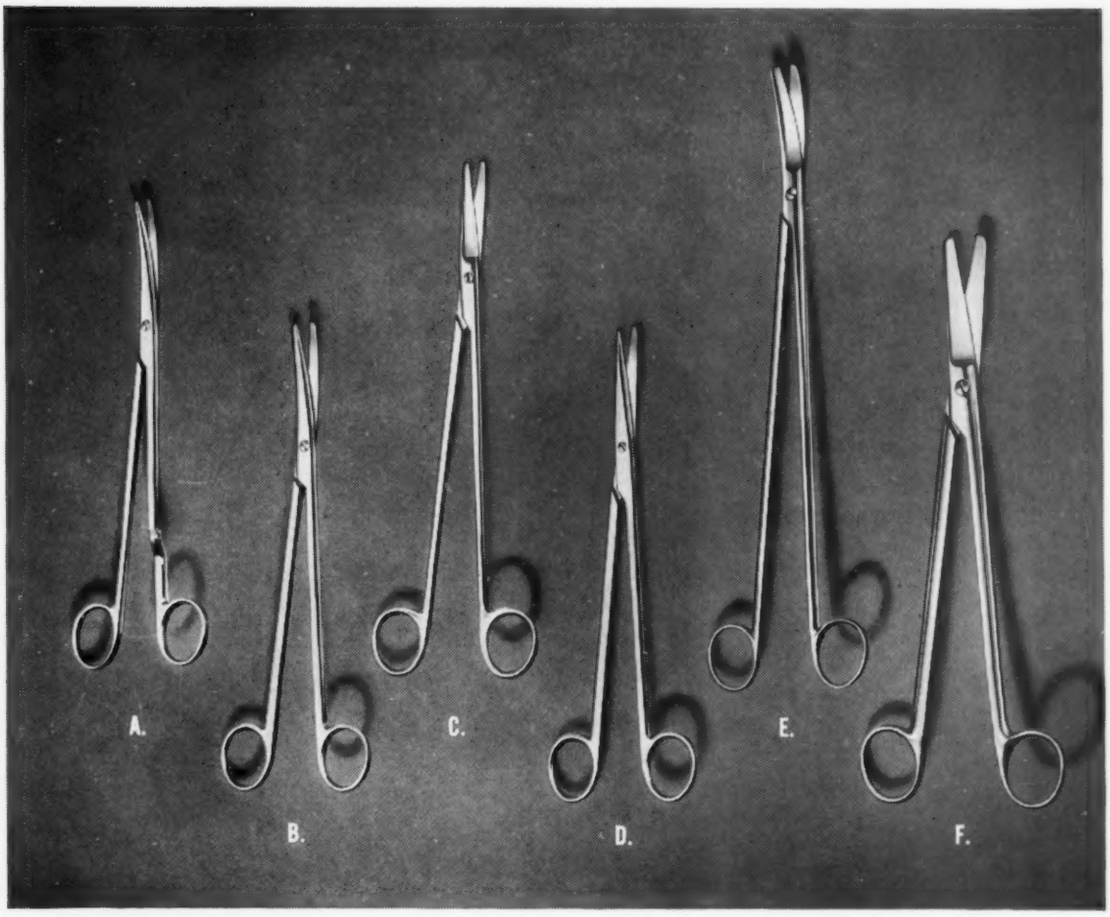

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AEROPLAST DRESSINGS ARE TOUGH AND FLEXIBLE. They remain in place despite friction or the stress of motion. They withstand washing. Yet they are easily removed by simple "peeling" without distress to the patient.

AEROPLAST DRESSINGS ARE IMPERMEABLE TO BACTERIA. Properly applied to aseptic lesions, sterility is maintained as long as the dressing is allowed to remain intact. In addition, Aeroplast in itself is bacteriostatic.

AEROPLAST DRESSINGS ARE SEMI-PERMEABLE TO WATER VAPOR. Normal perspiration is permitted to escape, although loss of vital fluids and electrolytes—as in extensive burns — is effectively retarded.

AEROPLAST DRESSINGS ADHERE TO ANY DRY SURFACE OF THE BODY. Regardless of location and structure or the extensiveness of the area treated, Aeroplast dressings "fit" and maintain their integrity. They do not restrict circulation, respiration, or desirable movement.

AEROPLAST IS NON-TOXIC, NON-SENSITIZING, NON-ALLERGENIC. The vinyl resin base is inert; the film which forms is insoluble in body fluids; and the ethyl acetate-acetone solvent evaporates in seconds following application.

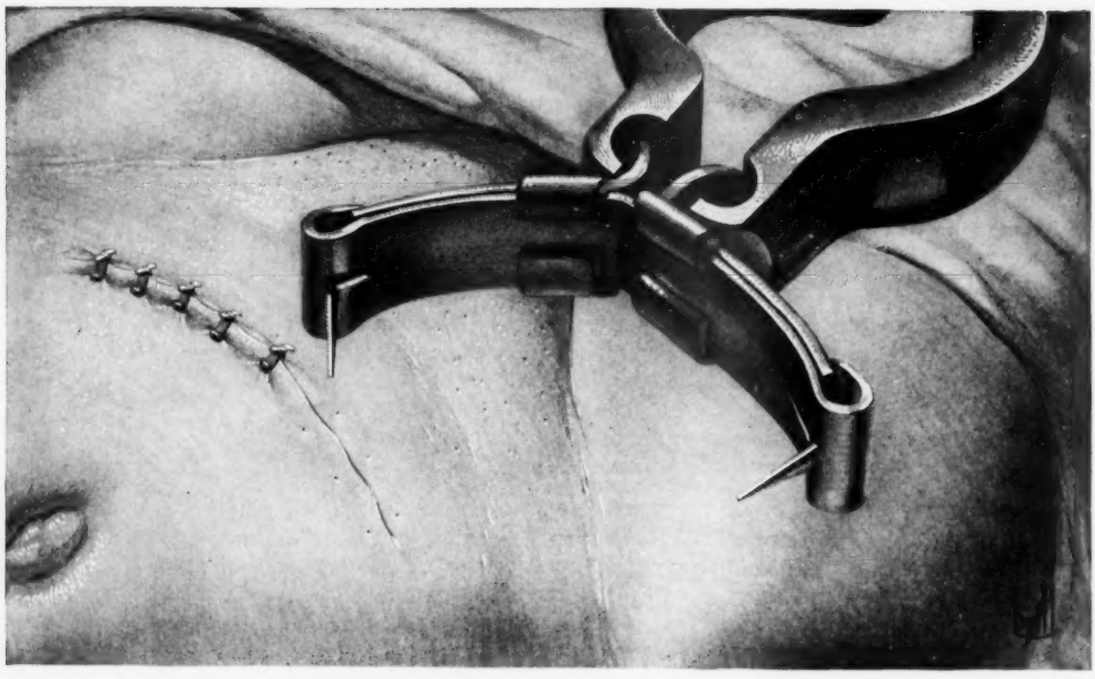
AEROPLAST DRESSINGS ARE TRANSPARENT. They permit critical evaluation of the progress of healing at all times without the necessity of removal and re-dressing.

AEROPLAST Liquid Surgical Dressing is an ethyl acetate-acetone solution of co-polymers of hydroxy-vinyl chloride-acetate and sebacic acid, 9.3% by weight, and modified maleic rosin ester, 3.1% by weight, with fluorochloro hydrocarbon gas as a propellant. STERILE.

Supplied in 6 oz. aerosol-type dispenser.

AEROPLAST is NOW available through your surgical supply dealer. For complete descriptive literature, write

AEROPLAST CORPORATION
420 Dellrose Avenue, Dayton 3, Ohio



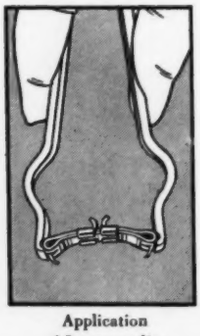
Removal of Serature "Spur" wound clip.

"They are so easy to remove... patients really appreciate them."

...SO EASY TO APPLY—AND PRODUCE SUCH EXCELLENT RESULTS— SURGEONS APPRECIATE THEM TOO

Only Propper's Serature Wound Clips have the unique, integral "spurs" for precise adjustment after primary application and quick, painless removal. Only Serature Wound Clips give you all these features:

- *needle sharp teeth, perfectly aligned, for speedy application, accurate closure, and minimal tissue trauma*
- *faster healing, reduced incidence of "stitch" infection and better cosmetic results*
- *speedy and pain-free "single-step" removal, at the identical angle as that of application*
- *economy of use because they're removed intact and are "pore sealed" to render them chemically inert and impervious to body fluids and sterilizing procedures . . . usable over and over again*
- *applied and removed with ordinary wound clip forceps—no special instruments required*



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SOMETHING NEW . . .

Single-Use unit of 4½ oz. contains in each 100 cc., 16 Gm. sodium biphosphate and 6 Gm. sodium phosphate—an Enema Solution of PHOSPHO-SODA *(Fleet).*

The FLEET ENEMA

Now in the new single-use disposable unit

A distinctive feature of this unit is its sanitary rectal tube protected by the **cellophane** ***envelope. After the tube is in position, the enema solution is instilled by squeezing the*** **polyethylene** ***container. A*** **special rubber** ***diaphragm prevents leakage and provides controlled rate of flow.***

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1. Burnikel, R. H. & Sprecher, H. C.: Am. J. Dig. Dis. 19:191, 1952.
2. Marks, M. M.: Am. J. Dig. Dis. 18:219, 1951.
3. Marks, M. M.: Personal communication, 1952-1953.
4. Sweatman, C. A.: J. South Carolina M. A. 49:38, 1953.
5. Hamilton, H., in Trans. 5th Am. Cong. Obst. & Gyn., Mosby, 1952, p. 69.

there is only one

FLEET ENEMA

DOSAGE: Adults: 4 ounces. Infants and children: 2 ounces or as directed by physician.

'Phospho-Soda' and 'Fleet' are registered trademarks of C. B. Fleet Co., Inc.

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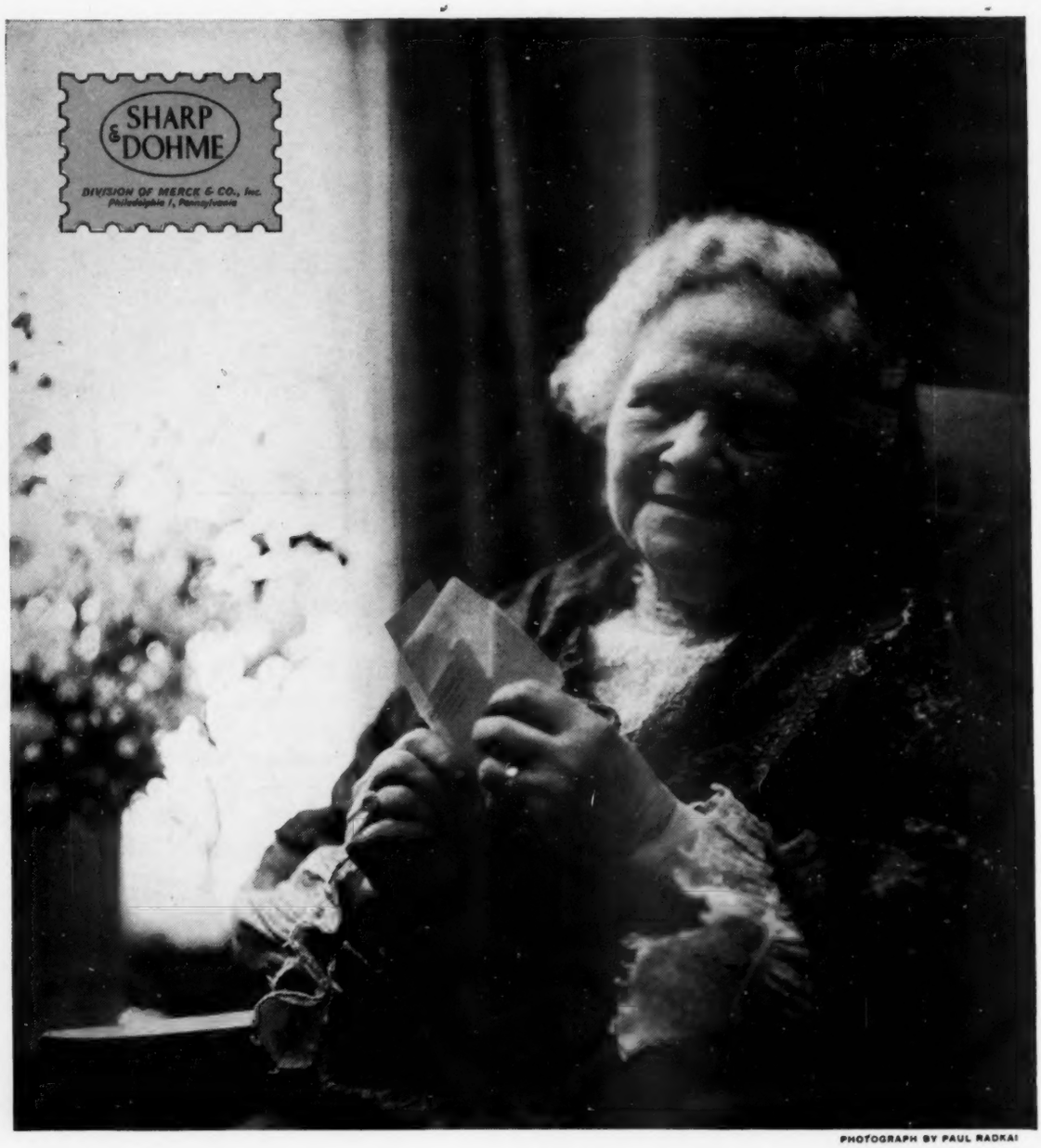

PHOTOGRAPH BY PAUL RADKAI

Smooth course after bowel surgery...

SULFASUXADINE®

SUCCINYLSULFATHIAZOLE

ACTIONS AND USES: Before and after bowel surgery SULFASUXIDINE provides:

Greater operative safety: Intestinal coliforms reduced 95 to 99.9 per cent[3]; an "empty and odorless" colon at operation[2]; minimal risk of local infection.[3]

Smoother and faster recovery: Postoperative peritoneal reactions are reduced[4]; the incision heals without complication.[5] Toxic reactions are rare.[6]

SULFASUXIDINE is also a valuable therapeutic agent in acute and chronic colitis.[6]

DOSAGE: 0.25 Gm. per kg. body weight per day.

SUPPLIED: Tablets 0.5 Gm.; Powder in ¼-lb. and 1-lb. bottles.

REFERENCES: 1. M. Clin. North America 27:189, 1943; 2. Rev. Gastroenterol. 15:151, 1948; 3. Surgery 18:200, 1945; 4. Postgrad. Med. 10:403, 1951; 5. Surg., Gynec. & Obst. 81:113, 1945; 6. N.N.R. 1952.

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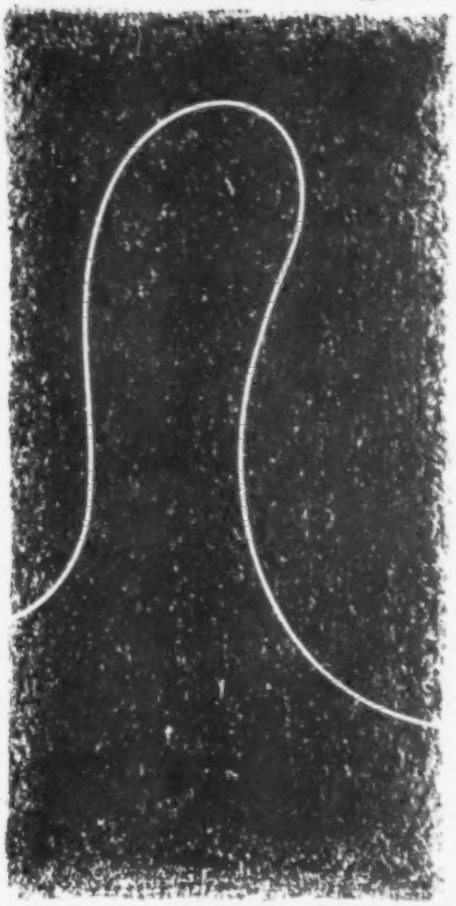

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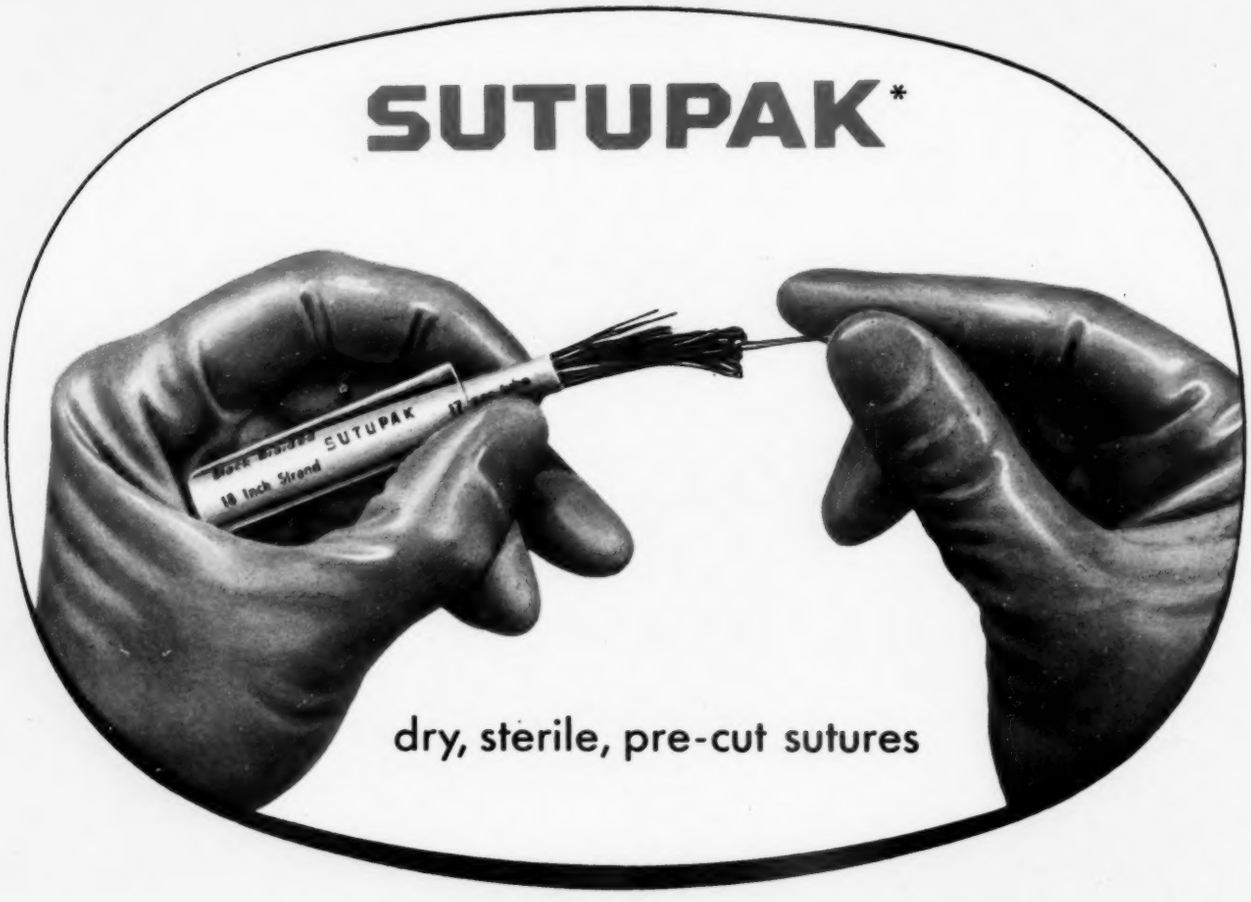

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minimal postoperative bleeding

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Safe—No untoward side effect, including thrombosis, has ever been reported.

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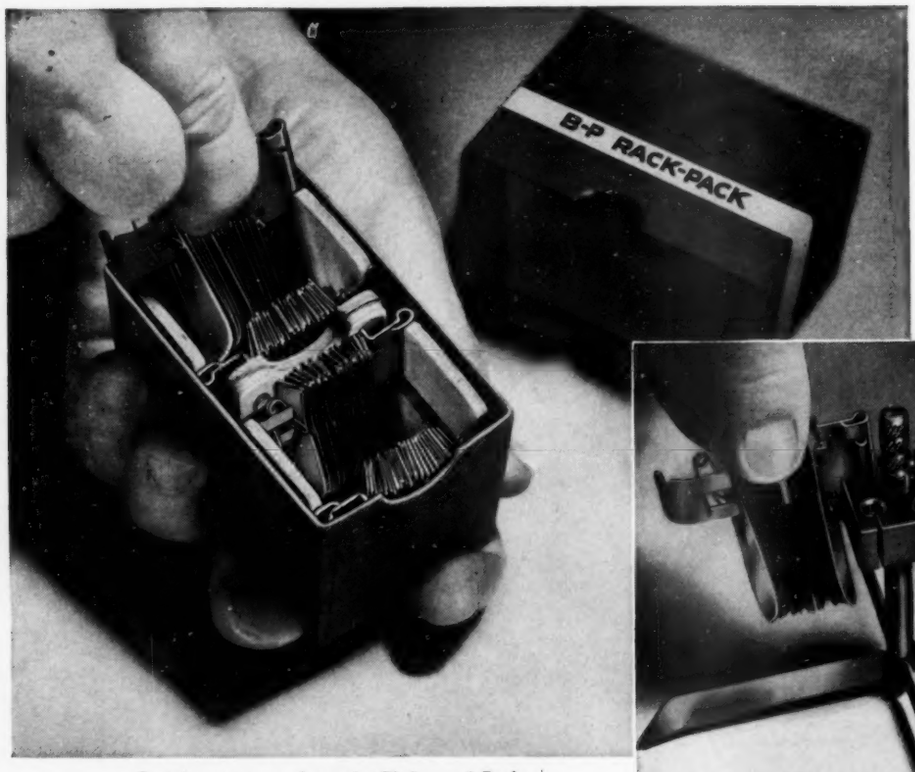
Chatham **CHATHAM PHARMACEUTICALS, INC.**, NEWARK 2, NEW JERSEY



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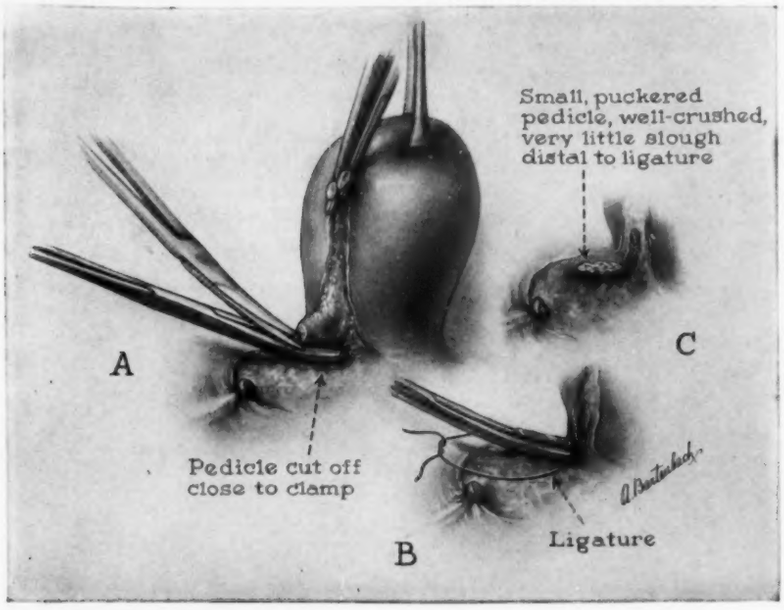
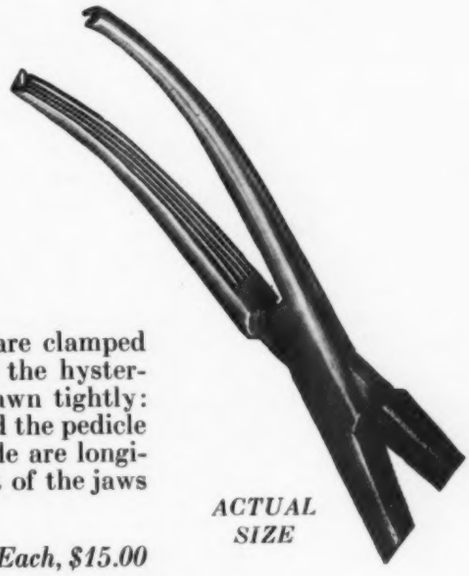
An Effective New Hysterectomy Clamp

By Russell C. Long, M.D., Mansfield, Ohio



Useful for Holding Securely Almost Any Pedicle Containing Many Vessels

This new hemostatic forceps employs the longitudinal serrations of a Carmalt and the 1 x 2 rat tooth end of a Kocher clamp. The blade is slightly curved and relatively broad, providing a strong clamp which will not permit a pedicle to be lost. It is useful for almost any type of work in which there is a necessity for such a clamp, long enough for a hysterectomy, and yet satisfactory for the mesentery of appendix, crushing and ligating omentum, vaginal hysterectomy, crushing the sciatic nerve or cutting across belly muscle. In total abdominal hysterectomy the ligaments are clamped as usual and all excess stump cut off flush with the hysterectomy clamp. Ligatures are placed and then drawn tightly: simultaneously the assistant releases the clamp and the pedicle puckers very well. Since the striations of the blade are longitudinal, the tissues will pleat but will not slip out of the jaws of the forceps. *Prompt delivery now.*



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***FURACIN*®**
BRAND OF NITROFURAZONE N.N.R.

A bactericide in stable, nontoxic dosage forms:

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FURACIN SOLUTION

1

2

An elderly man had suffered severe burns 16 days previously. Fine mesh gauze impregnated with Furacin Soluble Dressing was applied and covered with wet pressure dressings (Fig. 1).

Following debridement, extensive skin grafting was performed several weeks later. The excellent results obtained are shown above, 6 months afterwards (Fig. 2).

In treating severe burns, gauze impregnated with Furacin Soluble Dressing may be used with the occlusive dressing technic or Furacin Solution by spray for the exposure technic. These have proven highly effective in controlling the surface infection which can delay healing or grafting of severe burns.

Some advantages of Furacin:

- wide antibacterial spectrum
- designed for external use only
- negligible toxicity for human tissues

Formulae: Contain Furacin 0.2% in water-miscible vehicles which dissolve in exudates.

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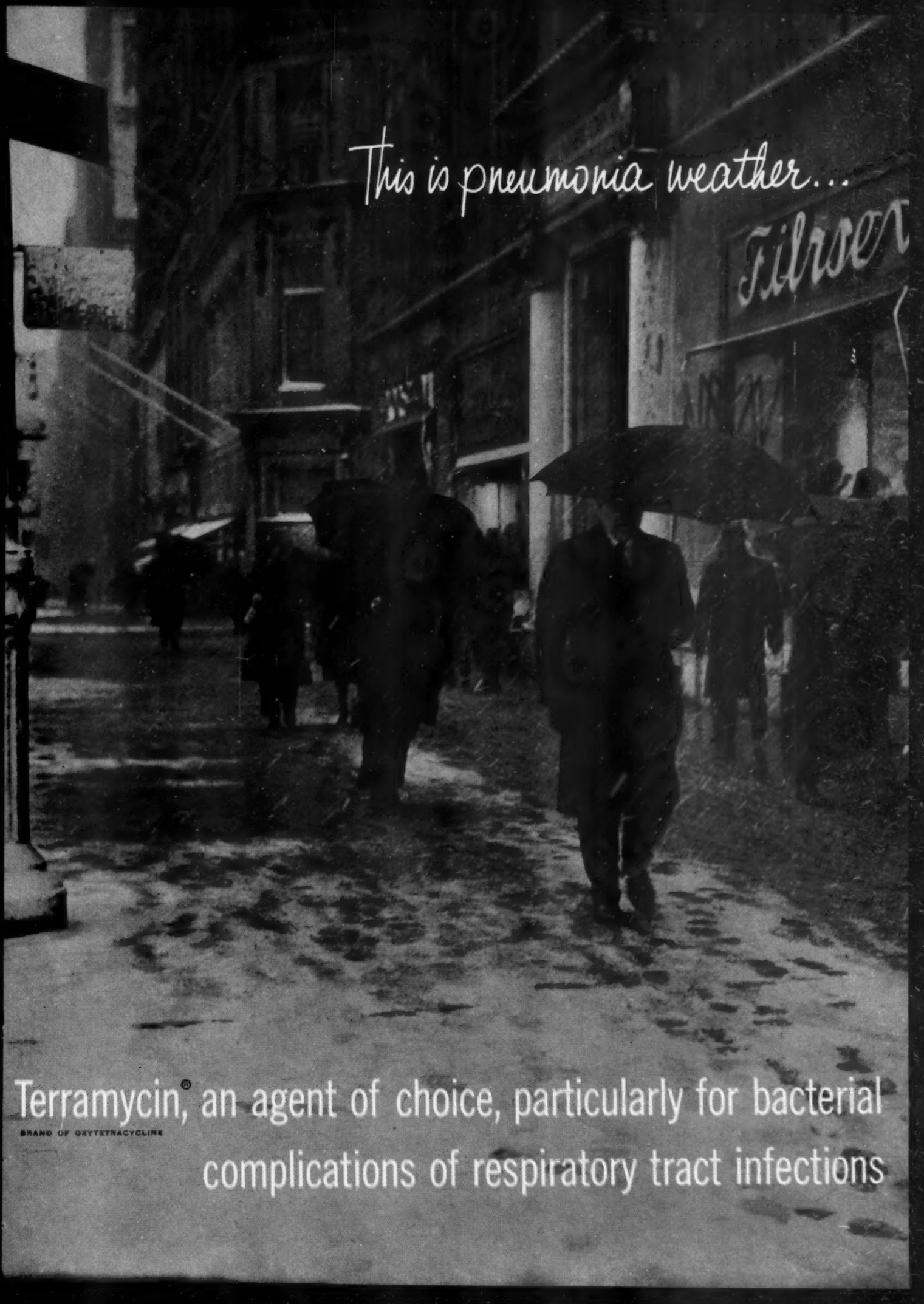

Terramycin®, an agent of choice, particularly for bacterial complications of respiratory tract infections

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The value of Terramycin in promptly controlling otitis media, severe sinusitis, laryngotracheobronchitis, bacterial pneumonia and virtually all infections of the respiratory tract, due to or complicated by the many organisms sensitive to Terramycin, is now a matter of clinical record.

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Precision workmanship, improved design and skilled metallurgical techniques assure that all Sklar instruments meet the exacting standards of perfection demanded by the profession.

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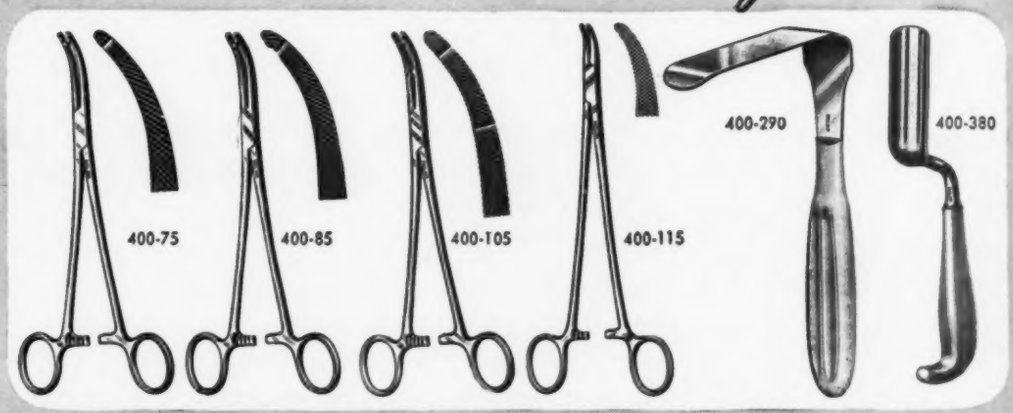


No. 400-75—Heaney Hysterectomy Forceps, light model, single tooth, 7¾ inches, box lock, *stainless steel.*

No. 400-85—Heaney Hysterectomy Forceps, heavy model, single tooth, 7¾ inches, box lock, *stainless steel.*

No. 400-100, same instrument, screw lock, (not illustrated.)

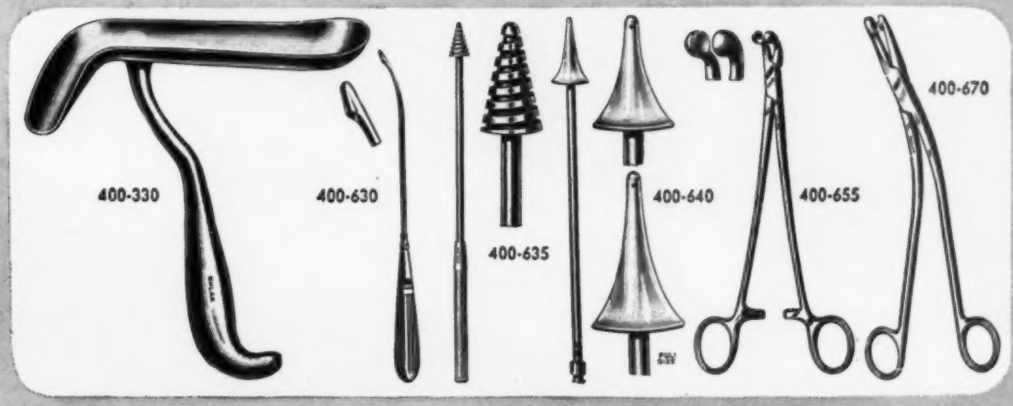
No. 400-105 — Heaney Hysterectomy Forceps, heavy model, double tooth, 8¼ inches, box lock, *stainless steel.*

No. 400-110, same instrument, 9 inches, screw lock, (not illustrated.)

No. 400-115 — Heaney Needle Holder, 8¼ inches, box lock, *stainless steel.*

No. 400-290—Brantley-Turner Vaginal Retractor, blade 4 x 1¼ inches, total length 7 inches. Blade only *stainless steel.*

No. 400-380—Tauber Vaginal Spatula, blade 3½ x 1¾ inches, total length 9¼ inches, *chrome plated.*



No. 400-330 — Bicek Vaginal Retractor, with spout for directing flow of biopsy material, blade 1¾ x 6 inches, *chrome plated.*

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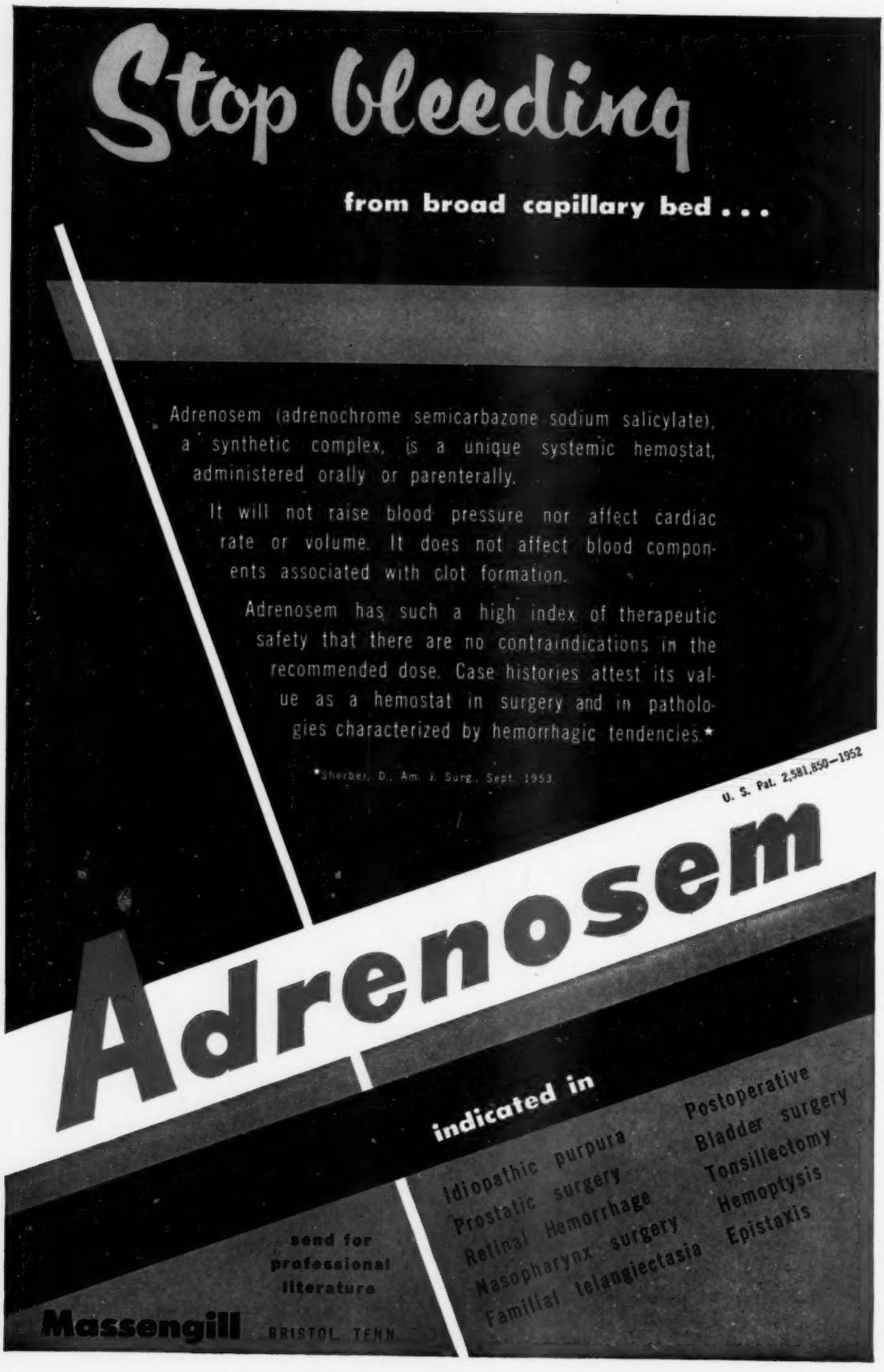
Stop bleeding
from broad capillary bed . . .
Adrenosem (adrenochrome semicarbazone sodium salicylate), a synthetic complex, is a unique systemic hemostat, administered orally or parenterally.
It will not raise blood pressure nor affect cardiac rate or volume. It does not affect blood components associated with clot formation.
Adrenosem has such a high index of therapeutic safety that there are no contraindications in the recommended dose. Case histories attest its value as a hemostat in surgery and in pathologies characterized by hemorrhagic tendencies.*
*Sherber, D., Am. J. Surg., Sept. 1953
U. S. Pat. 2,581,850—1952
Adrenosem
indicated in
Idiopathic purpura
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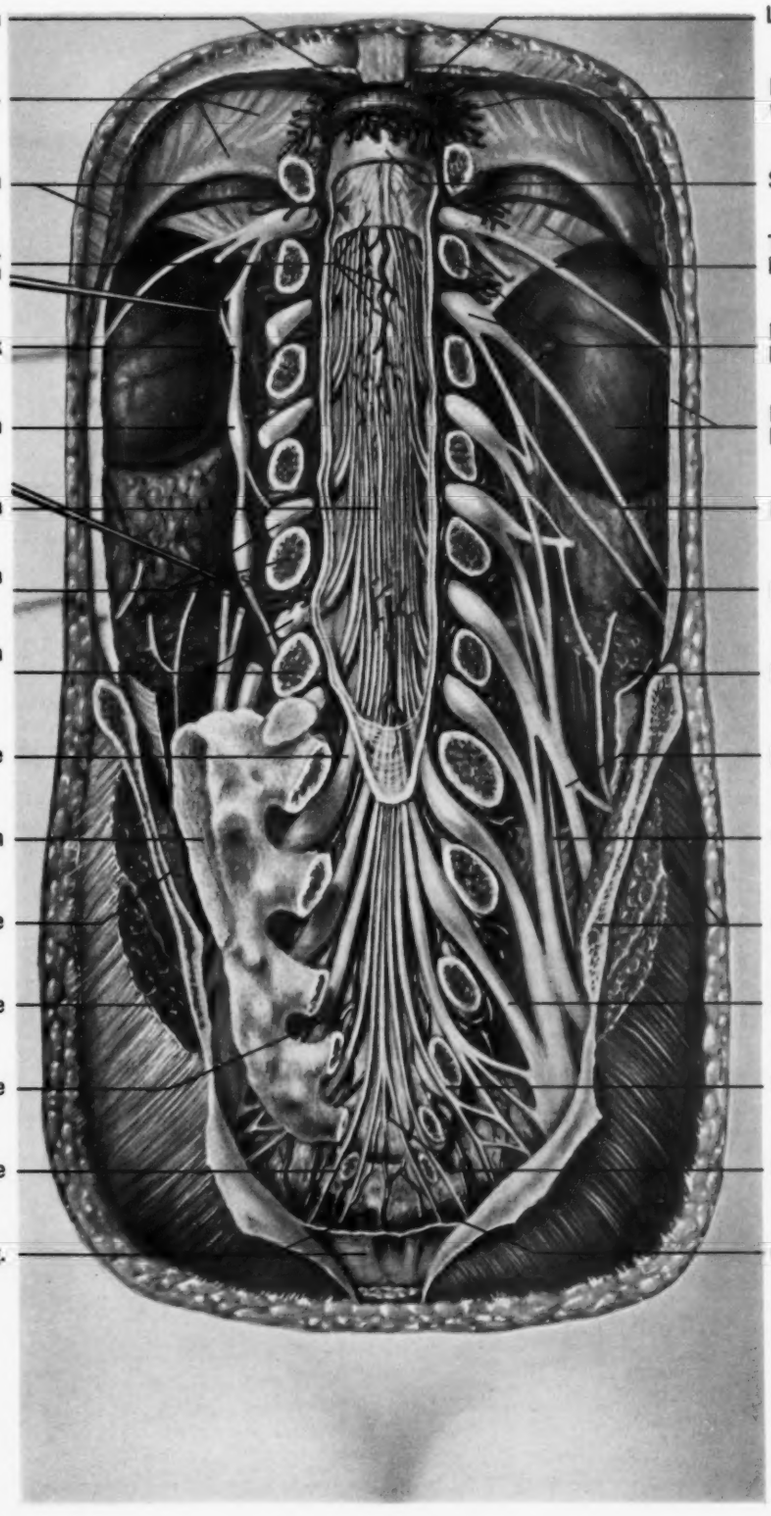

This is one of a series of paintings for Lederle by Paul Peck, illustrating the anatomy of various organs and tissues of the body which are frequently attacked by infection, where aureomycin may prove useful.

Lederle

A wide variety of infections
of the spine are caused
by organisms susceptible to

Aureomycin

HYDROCHLORIDE CRYSTALLINE

This antibiotic is therapeutic
for such infections,
including chronic osteomyelitis
of the pelvis and sacrum.
It is also useful as a
prophylactic prior to surgery.

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preoperative bowel preparation within 24 hours:

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Each tablet contains 0.5 Gm. neomycin sulfate (equivalent to 0.35 Gm. neomycin base)
Available in bottles of 20 tablets

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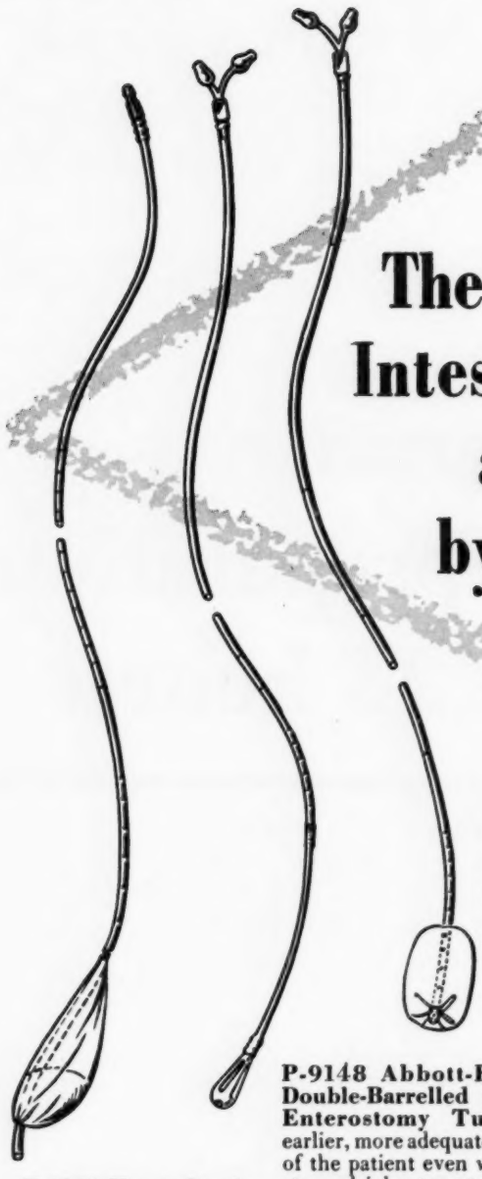

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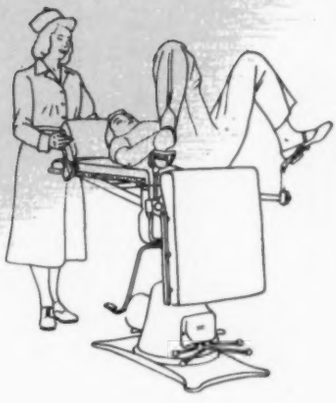
with a *Ritter* PROCTOLOGIC TABLE



Designed in cooperation with leading proctologists, only the Ritter Proctologic Table, Type 7, features automatic elevation of the leg section above the high line of the body section as the leg section is lowered from horizontal to vertical. As a result of this exclusive feature, an abdominal drop-out area is immediately created. The depth of the drop-out area can be easily adjusted.

Standard equipment includes adjustable headrest and kneerest with snap-lock adjustable leg strap on kneerest. The table is normally supplied with a foot lever tilt lock, as illustrated. A touch of the toe on the foot pedal and the motor-driven, hydraulically-operated base raises patients effortlessly, quietly from 29″ to 47″. Table tilts 55° head low and rotates 180°. Hip rest cushion and stirrups are available at slight additional cost. Hand wheel tilt at slight additional cost. Standard silver metallic finish and black Masland Durasol upholstery. Ask your Ritter dealer for a demonstration or write to the Ritter Company, Inc., Ritter Park, Rochester 3, N. Y.

Ritter

Melmac* Orthopedic Composition

for lighter, thinner, stronger casts

Davis & Geck's Melmac Orthopedic Composition is a melamine resin,† a new powder with catalyst which *doctors* add to the water in which *they* wet plaster bandages. With Melmac Orthopedic Composition, *doctors* need only *half the usual number of plaster of Paris bandages.* Melmac has been proven by extensive clinical trials.[1-3]

Greater comfort for patients

Cast A—ordinary plaster of Paris

Cast B, *plaster fortified with Melmac*, is half thickness of cast A and weighs less

6 great advantages of casts made with Melmac Orthopedic Composition

1. *Four times the early strength* and over twice the dry strength of ordinary plaster of Paris casts.
2. *Lighter, thinner and stronger casts* provide added comfort and support.
3. *Water and urine resistant.* Does not disintegrate even after several days soaking.
4. *Permits better x-ray penetration* due to thinness of cast.
5. Economical—*50% fewer bandages or less needed;* saves the doctor time.
6. *Conveniently packaged* to permit using as much or as little as is needed for a given case, avoiding waste.

Supplied: In cartons of 3.65 lb. containing six cans of 9.74 oz. (276 Gm.) each; available through surgical supply dealers handling D & G products.

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A unit of American Cyanamid Company

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Sutures and other surgical specialties

*TRADEMARK
†PRODUCT OF AMERICAN CYANAMID COMPANY

Use of Melmac requires no new technique

To use bandages and splints wetted with Melmac solution, no new technique for applying casts need be learned. Plaster rolls or splints are soaked in the Melmac solution in the usual manner, the excess solution is pressed out, and the cast applied with the same technique as with ordinary plaster bandages and splints.

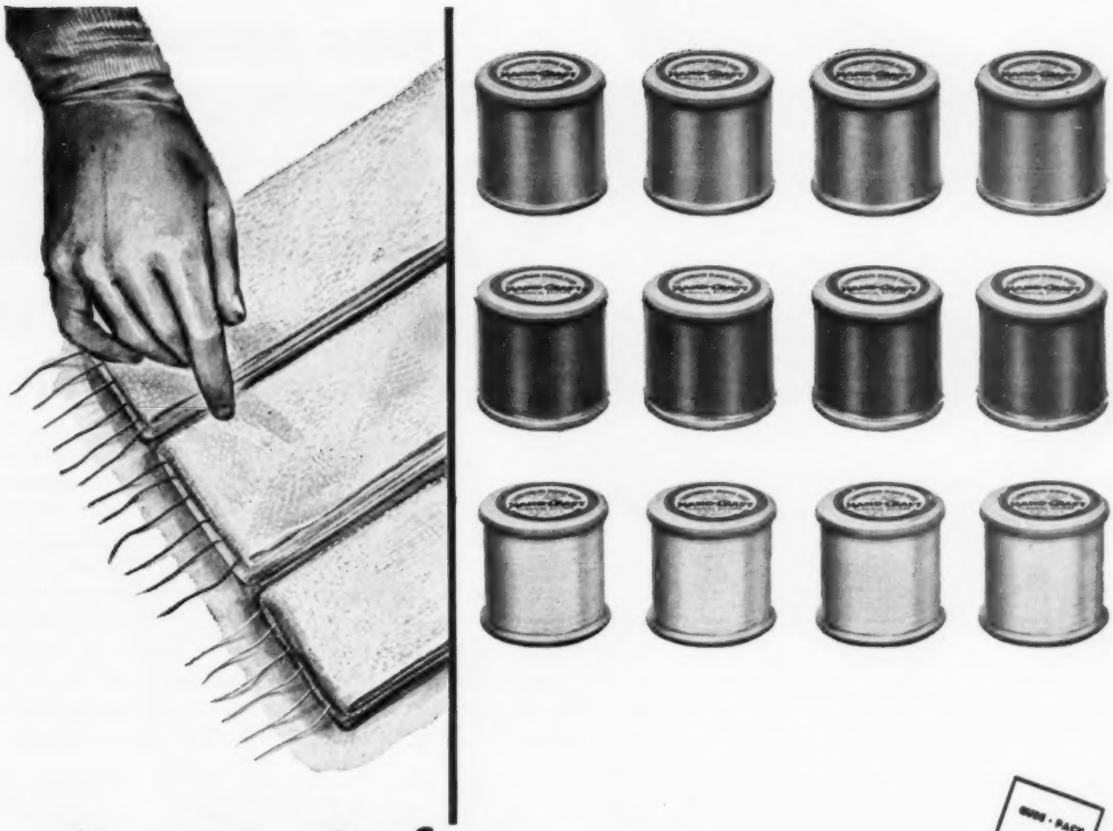
Note:

Cobey,[3] reports not one person allergic to Melmac in applying 1000 casts.

references:

1. A. W. Spittler, Col., (M.C.), U.S.A., J. J. Brennan, Lt. Col., (M.C.), U.S.A., J. W. Payne, Capt., U.S.A.F. (M.C.), American Academy of Orthopedic Surgeons, Jan. 26-31, 1952, Chicago, Illinois.
2. M. C. Cobey, M.D., F.A.C.S., Professor of Orthopedic Surgery, Georgetown University and Senior Attending Orthopedic Surgeon, Children's Hospital, Washington, D.C., The American Surgeon, Vol. XVIII, No. 4, April, 1952, pp. 413, 415.
3. M. C. Cobey, M.D., F.A.C.S., Washington, D.C., private communication.

Davis & Geck manufactures a complete line of surgical sutures. Diameter for diameter, the tensile strength of D&G Surgical Gut is unexcelled by any other brand.



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All confusion as to the size of cotton sutures is now eliminated. You can identify size merely by noting the color.

Gudebrod now gives you **color-coded** cotton with each of the three popular sizes a different color. U.S.P. 4-0 is pink, U.S.P. 3-0 is blue and U.S.P. 00 is white.

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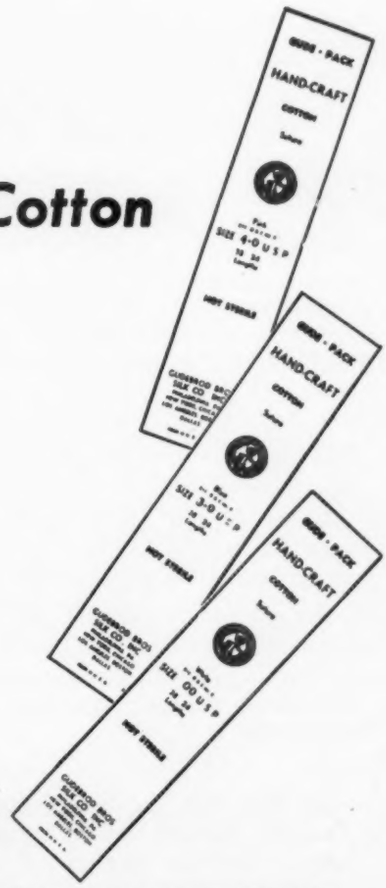

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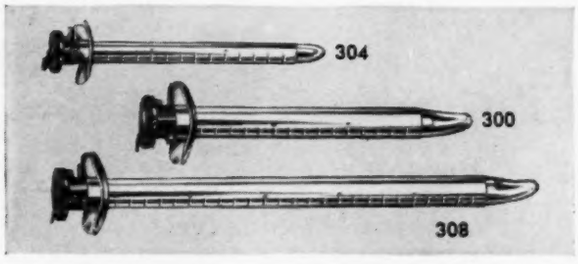

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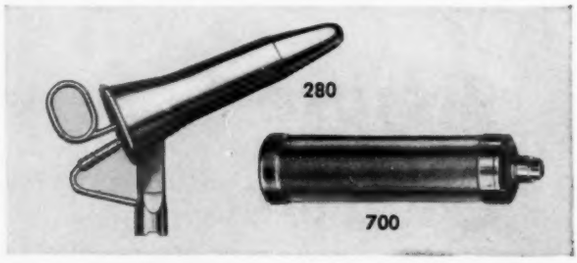

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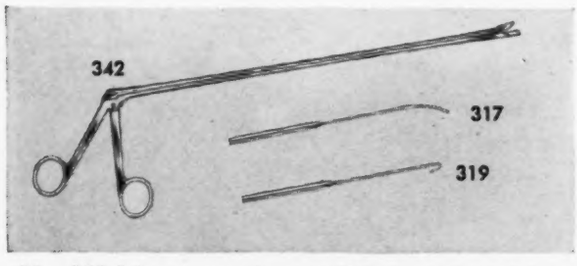

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Sixty-second Year of Publication

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Papers of the Scientific Sessions

THE ORIGIN AND MANAGEMENT OF CANCER OF THE COLON AND RECTUM*

FRANK H. LAHEY, M.D.†

Boston, Massachusetts

APART of the title of this paper is purposely misleading. It is misleading in suggesting that I could bring to you anything really fundamental in the origin of cancer of the rectum or colon, but it is not misleading from the standpoint that you have the opportunity to deal with the origin of cancer probably more directly, more intimately, and under ideal circumstances more successfully than in almost any other field of surgery.

We can still speculate about the origin of cancer. I do not believe, however, that any investigator would do more than to say that he has some interesting leads as to how cancer can be produced experimentally: the development of the possibility of the pituitary thyroid axis as a promoter of cancer, and the still acceptable theory of continual irritation, which is so well illustrated in our experience with ulcerative colitis. Last fall I noted the increasing conviction on the part of those who were interested in proctology in South America, where amebic ulcerations are so common, that these lesions are related to an increased incidence of malignancy.

I have just discussed papers at the last meeting of the American Gastroenterological Society, and the American Medical Association, as to the probable incidence of carcinoma in a patient with ulcerative colitis of long standing. There is no doubt in our minds that this demonstrates the fact that the destruction and repair which go along with ulcerative colitis each year that the patient has the disease increase the hazard of malignant degeneration to the point that practical surgeons interested in the colon and rectum would agree that in patients who have had ulcerative colitis for ten years or over the incidence of malignancy is 20 to 30 per cent.

An excellent example of changes which may be observed clinically is carcinoma of the lip and the tongue in industrial diseases. Such diseases produce chronic irritation, destruction and repair, until finally the stage of malignancy is reached; it is one of the most fascinating of the demonstrations of malignancy. In polyps there is something that arouses everyone's curiosity, and that is, purely from the speculative point of view, the inciting factor that can stimulate a relatively small cluster of epithelial cells so that they will overgrow to the extent that the lesion with which proctologists deal so frequently, the pedunculated polyp, is produced.

Here is a factor within a very limited area which possesses, for some reason that we do not yet understand, the capacity to incite in the epithelium an overgrowth that can eventually result in a carcinoma.

What has been our experience with these

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† Deceased.

polyps and with malignancy in them? Can we rely upon the pathologist's diagnosis: The pathologic changes in the pedunculated polyp are not unlike those in the thyroid gland. We have repeatedly said that many pathologists dealing with routine pathologic material, not with many polyps, are like many of the men who deal with a limited number of thyroid cases. Often they have not had the opportunity to observe the variety of types and the variety of changes to interpret these in true terms of malignancy, and to differentiate and disregard some of the microscopic factors in these lesions that would tend to indicate malignancy in other lesions.

If the surgeon depends upon abnormal epithelial architecture, cell structure and mitotic figures in the pedunculated polyps to interpret true malignancy and non-malignancy, he would go as far astray as in the interpretation of some of the thyroid pathologic material which is equally misleading.

We and our pathologists have come to believe that there is but one dependable feature in the microscopic determination of malignancy, particularly in these pedunculated polyps, and that is invasion. This is true also in thyroid pathology. In carcinoma of the thyroid mitotic figures and abnormal architecture can be seen, but the presence of malignancy can finally be settled almost solely by its obviously invasive character. That has made Swinton, who has been interested in the local removal of these lesions, and those of us who have done colotomies willing to treat conservatively some of these pedunculated lesions in which the pathologic diagnosis is doubtful or even those lesions which some pathologists consider definitely malignant. It has led me to depend often upon clinical rather than microscopic evidence in cases of the pedunculated polyp. When these polyps with short pedicles show induration in the base, and particularly when they show ulceration in the base, I do not rely upon the pathologist to determine what I should do. When a clinical observation is confirmed by a positive pathologic finding, radical procedures such as abdominosacral and radical colonic resections are necessary.

I would like to talk to you informally and out of the well of my own personal experience. I firmly believe something that I have preached for years, and it has led me to disagree with some of the proctologists, but that is healthy and a good thing. It has led to the conviction that has proved sound in our hands, and that is that the smaller the lesion, the more aggressive should be the surgery; that the greatest danger in cases of malignant disease is that you will yield to the appeals of the patient, or his medical friends, to limit the extensiveness of the procedure because of the size of the lesion.

It has been interesting to grow up in a clinic concerned with both thyroid disease and rectal and colon disease, because they are so similar. Let me illustrate this similarity in terms of comparable thyroid pathology.

We have found it extremely difficult to convince internists and family doctors that a discrete adenoma of the thyroid is really the origin of cancer of the thyroid. We have succeeded fairly well in convincing them that the incidence of malignant disease in discrete adenomas of the thyroid is so high that all of them should be removed. At the last meeting of the Goiter Association we reported that 33 per cent of the last seventy-eight discrete adenomas of the thyroid were malignant.

It is equally difficult to convince the men who do not deal with this subject that a small lesion requires more radical surgical measures if they can possibly be done than does the large lesion, with which they would agree without reservation. Therefore, I would like to start this discussion with the conviction that if one of these polyps has spread on to the base, radical abdominal surgery should be performed.

What makes the difference in the broad base polyp, and how do we manage such cases? We are committed to the position that biopsies are not to be depended upon in cases of sessile or broad base polyps. In the case of broad base polyps just within the anus, we must err on the side of safety, and even though we get many negative biopsies, if the polyp is large, if it is broad based, it is infinitely better to sacrifice the sphincters, to do an abdominosacral operation than it is to go on doing biopsies while a low grade malignancy in the base of the ulcer continues to progress into the lymphatics and into the blood vessels and produces conditions that cannot be remedied by the most radical surgical procedure.

I would like to call your attention to something about which we have made a mistake, and that is congenital polyposis. In this condition again we have evidence of the origin of

malignancy. What is the factor that can be handed down through families to produce this lesion, so many of which become malignant? I would like to present a case report in which I made a mistake. I operated on this boy twenty-three years ago. I removed four polyps in a case of congenital polyposis, all of the colon, and the sigmoid down to the top of the rectum, and anastomosed the ileum. Twenty-three years later he had a malignancy with an extension up into the ileum, so that he now has multiple polyposis in the ileum. Based upon our experience we should be more ruthless in the treatment of this lesion. We should be more aggressive in dealing with families, and urge them strongly, particularly in the case of children with multiple polyposis which is so similar to ulcerative colitis, in which the colon has been destroyed, that if they wish to prevent this type of delayed lesion, patients must submit early to radical abdominosacral resection and ileostomy.

We can now do ileostomies so well, ileostomy bags are so well developed and so dependable, that anyone today, man or woman, can live what amounts to practically a normal life with an ileostomy bag. It is for that reason that I plead that we do not permit patients to pass to the stage of congenital polyposis in which there are three or more distant malignancies. In such cases, even though total colectomy be done, the patient has practically no chance of survival.

Every one of these patients is not unlike the patient with ulcerative colitis and the patient with discrete adenoma of the thyroid. All of them can be demonstrated in time. The thing that kills patients is our sentiment about their sphincters. We must discuss the problems with their families and place the responsibility of the eventual fatalities such as this on the families in an endeavor to make them accept a method of treatment which as yet is not proven, but probably will save them from later fatalities.

I want to bring to you our experience with polyps and some warning. Polyps are often discovered by the gastroenterologist, and they are difficult to find. I would like to urge two things upon you: Never operate upon a patient with a polyp that has not been demonstrated roentgenographically at least twice on different occasions, and each time marked with an arrow. If you want to be absolutely sure concerning doubtful ones, roentgenograms should be taken three times, each time marked with an arrow, each time proved to be in the same place, and each time proved to be of the same typical outline.

Let me urge one more thing when removing polyps by colotomy or sigmoidostomy, have the roentgenologist present. The roentgenologist can be a source of great comfort to you. He can interpret roentgenograms in terms of levels of the colon. Not all polyps have long pedicles that can be pulled to demonstrate the dimple. Not all polyps have bodies that are easily defined. I know of nothing which has caused me more chagrin than to have explored for polyps, not be able to find them, have them again demonstrated, reoperate and find them.

There are a few things about polyps that make us suspicious of malignancy. Some polyps look as though they were originally pedunculated polyps. When the pedicle has become shortened and broad, we become extremely suspicious that they are malignant, and prepare the patients and the families for radical removal.

At the clinic we perform a great many operations on the colon and rectum. The first question that is asked every patient who comes to the clinic is, "What do you come for?" Dr. Swinton studied 300 cases of carcinoma of the colon and rectum. He found that in 97.7 per cent of the cases, which proved to be carcinoma of the colon and rectum, the patient came because of alteration in bowel function, blood in the stools, or abdominal cramps or pain. I stress this for this reason: 50 per cent of all patients with carcinoma of the colon and rectum, regardless of the grade, who do not have blood vessel invasion and who have a radical operation, are alive and well five years after operation without recurrence. The survival figure drops to 37 per cent when there is lymphatic invasion, to 30 per cent when an adjacent structure is invaded, and to 14 per cent when there is blood vessel invasion.

If we could concentrate on the lay community with this single feature alone as much as we have with breast tumors, we could improve these figures tremendously. We have done a good job concerning breast tumors. We know that women have responded. They palpate their breasts, and go for regular examinations. Doctors do a better job examining them. But we have neglected to publicize the ability to make the diagnosis of

carcinoma of the rectum and colon earlier than we do.

Where do we have a comparable lesion that offers such a high five-year survival rate? Where do we have a comparable lesion that offers the opportunity for early diagnosis from history alone? Proctologists particularly, with their interest in this lesion, should promote more and more publicity concerning the importance of the symptoms of blood in stools, alteration in bowel function and abdominal cramps or pain.

TABLE I
CARCINOMA OF THE COLON

Group	Percentage of Patients Living and Well for 5 Years	Percentage of Patients Living and Well for 10 Years
Unfavorable (lymph nodes involved and local invasion)	21.0	15.7
Favorable (lymph nodes not involved)	64.3	57.1

TABLE II
CARCINOMA OF THE RECTUM AND RECTOSIGMOID

Group	Percentage of Patients Living and Well for 5 Years	Percentage of Patients Living and Well for 10 Years
Unfavorable (lymph nodes involved and local invasion)	30.2	23.2
Favorable (lymph nodes not involved)	60.0	51.8

Dr. Colcock at the clinic made a study of the five- and ten-year survival in cases of carcinoma of the colon and of the rectum and rectosigmoid, with and without involvement of lymph nodes and local invasion. The results are shown in Tables I and II. It was found that if patients with cancer of colon and rectum survive five years after operation, even if lymph nodes are involved, probably only 8 or 9 per cent will be lost in the second period of five years.

Just a few words from my own experience concerning the magnitude of operations. How do we feel about sphincter-preserving operations? I know that good sphincter-preserving operations can be done. I have no debate with those who do sphincter-preserving operations who have adequate experience. But the thing I want to promote again in terms of saving more lives in patients with carcinoma of the rectum and colon is, we want to do an operation that will fit the degree of anaplasia of the lesion. What is true of thyroids is true of rectums. In thyroid carcinomas we have three grades, the papilliferous, the follicular and the infiltrating small round cell and giant cell. Operations on patients with the last-mentioned type of carcinoma are almost a waste of time. Such a small percentage of them survive over five years that it is hardly worth doing radical neck dissections and giving 2 million volt x-ray radiation.

The same thing, in a measure, is true of the rectum. The grade of anaplasia determines the five-year survival rate. Of 1,200 patients with low grade malignancy, lymph nodes were invaded in only 16 per cent, and of 165 with high grade malignancy, lymph nodes were invaded in 96 per cent.

It is for that reason we wish to do an operation on the rectum that will be adequate, no matter what the pathologist reports after the lesion has been sectioned. A good operation for cancer of the rectum involves removal of the longest possible segment of colon and rectum, up to and, if necessary, including the splenic flexure, if the lymph nodes are involved. To remove the largest possible amount of mesentery into which lymph nodes drain, a long segment of colon should be taken out. The largest possible amount of levators should be removed. The middle hemorrhoidal vessels should be tied as far out on the pelvic wall as possible. The inferior hemorrhoidal vessels also should be tied because of the possibility of extension of the lymphatics out along them. The anus and rectum should be removed because we believe that when they are removed, a more radical and a more extensive operation is done.

It is for this reason that I have been opposed to any operation that limits the extensiveness and the radicalness of the procedure. In addition to that, I have preached, and I firmly believe, that the bad name given to a colostomy is undeserved. I have repeatedly said that patients have been educated falsely against

colostomies. Their knowledge of colostomy is based upon the palliative colostomy. Unfortunately, the patient with a palliative colostomy is extremely vocal, as are all of his friends, and the neighborhood is completely aware of his suffering, unhappiness and general disability.

It is not the colostomy that produces this; it is the unremoved lesion in most of the cases. Unfortunately, the patient who has had the lesion removed and has a good colostomy is extremely anxious that it not be known that he has a colostomy, except that he will go with his physician to convince an individual who needs it that a colostomy is not the terrible thing that has been said about it. I am sure that if more patients knew how well people can get along with a colostomy, how well they can live, function, work and play, many more patients would be willing to accept it.

I am happy when I have done a procedure which I think will offer the patient the best chance for five-year survival, even though it has been necessary to disregard the patient's likes and dislikes.

In closing, I would like to say just a few words about colostomy. We have done thousands of colostomies and have learned some things about them. I have read in the literature of the mucosa being kept at the level of the abdominal wall. We have operated upon a great many patients for strictures and injuries to the bowel. We have learned that an external biliary fistula will not stay open because the secretory pressure of bile is not great enough to overcome the ingrowth of scar tissue.

We have likewise learned that with colostomy if the mucosa is on a level with the skin in a great many cases the ingrowth of skin and particularly formation of keloids will produce a stricture. Most instances of strictures of colostomies are keloid strictures; they are not fascial strictures. To prevent a stricture of a colostomy the colostomy should be made twice as long as you want it to be on the level of the skin, so that the end of the colostomy will eventually seek skin level, and will have two thicknesses of mucosa, and it will be above the level of the skin at least 2 inches, which will make it easy to handle.

If there is stricture of a colostomy, it is usually a keloid stricture, and it is not necessary to operate again on these patients. You have only to inject them with procaine, take a "V" out above and below, and then have them put their fingers through the colostomy at least twice every week. The difficulty with colostomies is largely related to the unwillingness to adhere to a strict regimen of a constipating diet. We always ask a patient with a colostomy to keep in touch with us for six months, either by mail or by personal visits because it takes six months for the colon to readjust itself to irrigation, instead of defecation. If the patient has an accident and soils his clothes, he loses his morale. We ask them to come back to us if they have any trouble. We try to determine whether they have adhered to their diet. We try to put them on a regimen that will give them solid stools. We teach them to keep themselves constipated. They must learn to depend upon two things, paregoric and boiled milk. Regularity of eating habits, regularity of irrigation and dilatation of the colostomy itself are essential and if the patient follows these rules most of them will not be unhappy with a colostomy.

PRIMARY ABDOMINAL WOUND HEALING IN SURGERY INVOLVING THE COLON

JAMES A. FERGUSON, M.D.
Grand Rapids, Michigan

A DEFINITIVE abdominal operation necessitates a primary wound, its closure and its healing. It is my purpose to record some clinical observations on the behavior of primary abdominal wounds under certain, rather uniform conditions.

TABLE I*

Operation	No. of Cases
Carcinoma (159 Cases)	
Abdominoperineal resection of rectum	89
Segmental resection of colon	55
Colostomy, palliative	13
Enterocolostomy, palliative	2
Other Diseases (41 Cases)	
Segmental resection of colon	15
Colotomy	26

* Average age in this series was fifty-eight years.

It is well known that the healing of a primary wound depends upon the age, general condition and the specific disease of the patient; upon the conditions under which the wound is made and closed; and upon the surgical technic of closure.

The clinical material submitted herein consists of a series of 200 individual patients, all of whom were subjected to operations involving actual opening of the lumen of the large bowel. Most of these patients suffered from neoplastic disease and were in the upper middle age group, their average age being fifty-eight years. This group of people debilitated by age, by neoplastic disease, and undergoing operations, all of which imply a potential contamination of the primary wound, would seem to comprise a group in which the conditions for wound healing *per primam* would be the least optimal. (Table I.)

Good hydration, a normal hemoglobin and a normal red blood count are, of course, desirable in all preoperative cases, and preparation for operation should keep these basic fundamentals in mind. All of these patients can be benefited if three or four days of hospitalized preoperative care is undertaken as a routine procedure. Conditioning may then be carried out without haste. The blood picture may be corrected if necessary, and antibiotic medication is started usually two days prior to operation. Hypertonic saline irrigations of the rectum are most important in dealing with rectal, rectosigmoid or left colon neoplasms, and in most instances produce a marked diminution in the severe inflammatory change associated with all of these lesions. In most cases the operative procedure is definitely facilitated by this one simple measure. Operating room environment is quite standardized as it is in hospitals all over this country, and fundamentals of aseptic procedure are observed.

From the point of preparation of the skin of the abdominal wall and of the hands of the surgeon to the point where sterile dressings are applied to the closed wound, we have evolved a standard procedure, none of the elements of which is new but which, in the aggregate, seems to work best in our hands. The skin of the abdominal wall and the skin of the hands of the surgeon are both prepared with pHisoHex®* (3 per cent hexachlorophene in pHisoderm); and although there are many products on the market which are said to do just as well, we are reluctant to change because results have been so satisfactory.

Triple thickness draping of the patient and isolation of the operative field is routine.

Whether the primary incision is vertical, oblique or transverse is of importance, but is not under discussion here *per se*, and it is self-evident that any wound which heals well *per primam* will give minimal trouble regardless of the direction of the primary incision. Generally speaking, we use transverse, muscle-dividing

* Product of Winthrop-Stearns, Inc., New York, N. Y.

and muscle-separating incisions for all procedures on the colon in the upper abdomen but continue to use the left vertical, paramedian and muscle-diverting incision for the classic Miles' operation.

In an effort to minimize the contamination and trauma to the tissue intervening between the skin and the anterior rectus fascia, we have discarded the use of skin towels which are intimately fixed to the skin edges either by multiple interrupted sutures or by towel clips. Both of these measures afford additional avenues of subcutaneous infection along the suture line or along the tract produced by the sharp towel clamp. We prefer simple investment of the edges of the wound with a moist saline pack which is held in place by the long blades of the self-retaining retractor.

The operative procedures on these 200 cases all involved opening the colon. The degree of opening of the colon varied from simple colotomy (for polypectomy) to subtotal colectomy. All primary anastomoses of the colon were of the open type. In the Miles' procedure the colon is transected and brought out through a stab wound left of the primary incision but is not actually opened in the operative field. Before bringing out the proximal colon through the secondary stab wound, actual cautery was used in all cases of combined abdominoperineal resections for division of the sigmoid or descending colon. Actual cautery has been used for so many years to divide the colon that a series of cases was run in which the cauterized bowel ends in the crushing clamps were cultured after the bowel had been divided. In fifty-four cases 75 per cent of the cultures showed no growth, while 18 per cent showed positive cultures of various organisms. (Table II.)

At the completion of the definitive operative procedure and before closure of the primary wound, all operators change gloves routinely, contaminated instruments are discarded and the wound is locally redraped. We are using continuous chromic catgut for closure of the peritoneum following which the wound is thoroughly irrigated with normal saline. Complete hemostasis is accomplished, and the anterior fascia is then closed with multiple, interrupted, figure-of-eight sutures of 32-gauge stainless steel wire. In no case and regardless of the depth of the panniculus is any suture material used to close the subcutaneous tissue. Many operators customarily re-approximate the superficial fascia of the abdominal wall (Camper's or Scarpa's, or both) with interrupted or continuous fine suture material, a step which is entirely unnecessary and contributes to tissue necrosis, liquefaction of fat, and hence to wound complications. Subcutaneous fat relieved of skin retention always everts and closure of the skin causes firm apposition of these opposing surfaces. It is a strong temptation to "obliterate the dead space" in a heavy panniculus. This impulse should be resisted even though the panniculus may be 6 or 7 inches in depth.

TABLE II

CULTURE OF BOWEL ENDS DIVIDED AND TRIMMED TO CRUSHING CLAMP WITH ACTUAL CAUTERY

	No. of Cases	Percentage
Sterile	39	72
Contaminated		
Proteus vulgaris	2	...
Staphylococci	7	...
Diphtheroids	2	...
Escherichia coli	2	...
Streptococci	2	18
Total cases	54	100

No. 00 plain catgut is used for hemostatic ties in the superficial fascia. It is rarely necessary to install excessive suture material unless one eagerly clamps and ties each tiny bleeding point. Most of the bleeding is self-controlled and two or three ties often suffice.

The skin is re-approximated by a continuous subcuticular stitch of stainless steel wire which abuts and does not compress the skin edges. Perforation of the skin around the primary wound occurs only at each end of the wound where this wire enters and exits.

Thus a closure is effected which involves no penetration or perforation of the skin or superficial fascia surrounding a primary wound and no compression of the loose subcutaneous tissues at the exact point where healing must start.

COMMENTS

Using the preceding uniform procedure in wound handling the 200 incisions under consideration developed a total of six wound complications. Of these six complications five were wound infections and one was a delayed in-

cisional hernia. Four of the five wound infections were very minor, localized, purulent processes, which necessitated superficial drainage and which cleared quickly and uneventfully. One of the wound infections was severe, extensive and productive of subcutaneous emphysema, necessitating wide open drainage with reluctant but ultimate healing. No case of complete wound separation occurred. (Table III.)

TABLE III
WOUND COMPLICATIONS IN A SERIES OF 200 CASES

	No.	Percentage
Infections	5	2.5
Dehiscence	0	0
Incisional hernias	1	.5
Total	6	3

It is reasonable to assume that wound complications totaling 3 per cent in an adequate series of cases, selected under adverse criteria, can be considered a good result. When one considers that only two of these cases had serious postoperative difficulties, the result is even better. It is hard to imagine how this incidence would be reduced even in healthier, younger patients.

SUMMARY

Primarily, this result is due to the application of sound surgical and aseptic procedures and to the potent effect of the antibiotic drugs.

It is my practice to use sulphathaladine (8 gm. daily) for three days prior to operation combined with parenteral penicillin (400,000 units) and streptomycin (1 gm.) one day prior to operation. The parenteral medication is then continued for approximately one week postoperatively.

Secondarily, we suggest that the use of skin towels intimately applied either by penetrating instruments or by suture material affords additional avenue for the contamination of the subcutaneous tissues and should be discontinued. Re-approximation of the panniculus by any type of suture material whatsoever is contraindicated.

Primary wound healing in a series of 200 patients with 200 wounds has been studied. These patients comprise a group of cases in which conditions are least optimal for wound healing and yet excellent results have been obtained using a uniform procedure as described.

Acknowledgment: Grateful acknowledgment is made to Dr. Lynn A. Ferguson for the inclusion of his clinical material in this study.

DISCUSSION

LESTER KNAPP (Buffalo, N. Y.): Dr. Ferguson should be congratulated on his technic and the results in primary wound healing in his 200 cases. I am sure that such results can only be obtained where faultless care and sound technic are employed. I can highly support the procedure employed and can add little to improve it.

One word of caution in regard to retraction might be added. It is known that wounds heal from side-to-side and not from end-to-end. I have seen many times cases in which a surgeon using utmost care will make an incision much too small for the operation involved and then forceably retract the wound. This will cause damage and will make the wound more susceptible to infection.

In reviewing our own cases for infection it was found it usually occurred in cases in which there had been previous colostomy or an existing inflammatory disease. A very careful dissection of these cases was done, and yet we still had wound infection.

Dr. Ferguson has made an exceptional record in the fact that he had no wound evisceration and only one hernia. In my checkup I found three eviscerations, two with wire and one with catgut, before they had gone very far. So I decided to stop right there and read his paper over again. I did not believe that the closure materials are the answer to this problem, however.

One word of caution in the routine use of antibiotics, I think, is apropos at this time. More and more fatalities due to antibiotics are occurring and being reported. In Buffalo we have had more than our share, some occurring where antibiotics were unnecessary, especially if the care and technic were of the type reported in this article.

Even penicillin and streptomycin have taken their toll, but the wide-spectrum antibiotics are the big killers and should be used with caution and when necessary.

Dr. Ferguson has given us a reminder to review out technic, and I am sure that we will have better results if we do check it more closely.

CLASSIFICATION AND TREATMENT OF CHILDREN WITH SEVERE CHRONIC CONSTIPATION

ORVAR SWENSON, M.D. (*By Invitation*)
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THERE are numerous causes for constipation among children. The most common etiology is faulty habit which frequently begins during the "run-around" age, that is, during the period when the child begins to walk and explore his surroundings. There are so many wonderful things for the two and three year old child to investigate that he rebels at taking time out for eliminations. At this age children are in a negative mood, and it is simple for anxious parents to aggravate the situation by ordering, even coercing the child to move his bowels. Thus the parents make an issue regarding what should be a perfectly normal function. This parental zeal often stems from the popular misconception that robust health is utterly impossible without daily, adequately sized movements. Early, harsh attempts at toilet training is another way of establishing a negative attitude in the child regarding bowel movements.

As the child's constipation becomes more established the problem grows in importance to the parents, and considerable emotional tension rapidly develops both on the parents' and child's part. While most children with constipation eventually develop reasonable bowel habits, a small number continue the symptoms and, in addition, begin to have fecal incontinence. These patients have no disturbance of urination. It is rare to encounter a patient with a neurologic lesion producing fecal incontinence in whom there is no disturbance of bladder control. In these children with fecal soiling there are usually definite emotional problems such as inability to adjust in a group and failure to keep pace in school. These patients are astonishingly resistant to treatment.

Constipation can be due to various pathologic conditions, but children affected with these entities are far in the minority compared to the group with poor habits and emotional problems. Children born with imperforate anus, regardless of what type of anoplasty has been performed, usually have severe constipation. It would seem reasonable to assume that incontinence would plague these patients but such is not the case. The explanation for this rather paradoxical situation may be related to the absence of an innervated anal canal. Consequently, these children have no sensory urge which normally forces a child to put forth an effort to evacuate the colon.

Children with myelomeningoceles frequently have both urinary and anal incontinence, and in this group constipation is a problem. Here again, soiling does not occur in most instances. The explanation of the constipation may, again, be absence of sensation in the anal canal, and hence no effort is made by the child to evacuate the colon.

The most rare of all conditions which produce severe constipation is Hirschsprung's disease. This disease consists of a congenital defect in the pelvic parasympathetic system resulting in an aganglionic segment of colon which is normally supplied by this portion of the autonomic system. The length of the lesion which almost invariably begins at the anus usually extends up to the sigmoid. Occasionally, it may extend to the splenic flexure, and on rare occasions it may involve the whole colon. The resulting absence of peristalsis in the involved colon accounts for the accumulation of fecal material in the colon proximal to the lesion.[1] These patients frequently have a lesion of the urinary tract. In most instances this consists of a large, rather atonic bladder. In about 5 per cent of the patients the lesion is more severe resulting in a malfunctioning bladder and megaloureters. This is due to the congenital lesion in the pelvic parasympathetic system.[2]

The diagnosis of myelomeningocele is obvious, and usually these patients' locomotion defects and urinary incontinence are such overwhelming problems that the constipation is of minor concern. Patients who have imperforate anus frequently develop severe constipation which develops some years after correction of their anomaly. In some this symp-

FIG. 1. Typical lesion of Hirschsprung's disease; note dilated sigmoid with narrowing of rectosigmoid and rectum.

tom is so severe that a diagnosis of Hirschsprung's disease is made and frequently they have been considered candidates for resection of the rectum and rectosigmoid. We have biopsied the distal colon in several of these patients, and all have had normal ganglion cells. Regardless of how severe the constipation is in these patients a resection of the distal colon would be of no help.

The differential diagnosis between habit constipation and Hirschsprung's disease can be made with fair accuracy from the history and physical examination. First of all, the constipation of Hirschsprung's disease dates from birth in practically all of our patients. It is not unusual for the patient with Hirschsprung's disease to have had obstipation in the first forty-eight hours with abdominal distention of such a degree that abdominal exploration was performed. Habit constipation usually begins at two to three years of age and there is rarely any abdominal distention. Patients with Hirschsprung's disease always have some abdominal distention with periodic increases in amount. I have never seen a patient with fecal incontinence and Hirschsprung's disease, and the presence of this symptom practically eliminates the diagnosis of congenital megacolon. Rectal examination is important, for in Hirschsprung's disease the rectum is usually empty despite large fecal impactions in the abdominal colon. Children with habit constipation will regularly have large amounts of feces in the rectum.

Patients with habit constipation of a severe degree and those with Hirschsprung's disease can be accurately differentiated by a barium enema. Enlargement of the colon is of secondary importance, and this single finding is not diagnostic of Hirschsprung's disease. The diagnosis can be made only by demonstrating a narrow rectum and rectosigmoid and dilatation of the colon proximal to this. (Fig. 1.) This examination may be extremely difficult to perform. The most important precaution to take to assure films of diagnostic value is to inject only a small amount of barium and to observe this as it fills the distal portion of the colon, with the patient in an oblique position. Frequent spot films must be taken in various projections to outline the rectum and rectosigmoid clearly.

The treatment of these various groups of patients differs greatly. The child with habit constipation can be helped by convincing the parents it is not desirable for them to supervise the child's bowel performance. To convince anxious parents that constipation is not of the great concern they believe it to be, I tell them about a patient I saw who had no movements for eight months. She was up and about doing well, not having had one headache during the entire eight months. Convincing parents of the relative unimportance of the habit type of constipation is probably the most effective way to remove this point of great contention between the child and his parents. I find a low residual diet is often more effective than a diet full of roughage. Mineral oil and milk of magnesia are prescribed in good amounts to force the child to move his bowels. The amounts are gradually decreased so that in six to eight weeks both are discontinued.

Patients with fecal incontinence are extremely difficult to cure, and we have had results only in those patients who have been carefully supervised by pediatric psychologists. These successfully treated patients have required long periods of treatment which have involved the parents as well as the child.

Patients with corrected imperforate anus and those with myelomeningocele can be cared for

only by daily colonic irrigation. They are committed to this regimen indefinitely, and as long as the routine is maintained there will be little, if any, fecal soiling. In rare instances in which soiling occurs despite this regimen a constipating diet is prescribed.

In the rare patient with congenital megacolon of the aganglionic type resection of the defective portion of colon will correct the situation.[3] Attention is called to the fact that in practically all patients with congenital megacolon of the aganglionic type there is absence of ganglion cells in the internal sphincter as well as the rectum and rectosigmoid. Surgical treatment, to be effective, should remove all defective colon consistent with preservation of anal continence. This can be accomplished by resection of all the involved colon to the internal sphincter with restoration of the intestinal tract continuity accomplished by a pull-through anastomosis which I have described in detail elsewhere.[4] Recently, it has been advocated that a limited resection should be performed on these patients which would leave the aganglionic rectum and part of the rectosigmoid behind—the reason given for this incomplete operation being that impotence would result from resection of these structures below the pelvic peritoneum.[5] The fallacy of this prediction is indicated by the fact that we have three adult male patients whose ejaculation has not been disturbed by complete resection of the aganglionic rectum and rectosigmoid. If surgery is to be used in the treatment of this disease, and our consistently good results in 125 patients resected indicates it is the treatment of choice, a complete operation should be performed. Stephens[6] who worked with me in 1947 and then returned to England has reported good results with our operation. Hiatt[7] has also reported good results using essentially our method.

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THE GENETIC FACTOR OF FAMILIAL DISSEMINATED POLYPOSIS COLI*

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IN reviewing the literature on familial multiple polyposis, two historical landmarks were found. They are (1) when polyposis became recognized as a separate disease; and (2) the time of recognition of its familial predisposition.

The first landmark appears to have been established by Luschka[23] in 1861 who described a colon containing thousands of polyps from the iliocecal valve to the anus, which polyps varied in size and shape. He stated that they consisted of glands resembling those of Lieberkuehn. Woodward[33] in 1881 recognized the tendency to confuse true polyposis and polyps secondary to inflammatory disease. He suggested "pseudo polyposis" for polypoid growths secondary to ulcerative colitis.

In review, the second landmark appears to have been established in 1882 by Cripps,[6] the first to describe a true familial multiple polyposis. He described two cases occurring in the same family. He believed that it was an extremely rare disease, that it was most common in early youth, that it had a definite familial tendency and possibly was related to cancer. In 1901 Boas[3] described the disease and spoke of its hereditary factor.

While early writers, such as Cripps,[6] made reference to the familial predisposition of the disease, Dukes[9] in 1930 was among the first to show it to be a definite mendelian characteristic.

In 1934 Lockhart-Mummery[21] asserted that the adenomatosis of the colon is an example of gene mutation. When the mutation has taken place, the results appear in succeeding generations either as dominant or recessive. If dominant, the condition will tend to occur in every generation; but if the resulting condition is recessive, it will be seen only when both parents carry the mutated genes. As this may not occur for many generations, the hereditary factor is very likely to be overlooked. In 1948 Hoxworth and Slaughter[17] expressed the same opinion.

The theory of somatic cell mutation states that certain tissue cells undergo a nuclear (genic) or cytoplasmic change leading to their rapid division to form a cancer or tumor. This theory was proposed by Tyzzer[29] (1916) and has been strongly advocated by Little and his school based on mouse genetics and by Lockhart-Mummery for human cancer in more recent years. This theory is now accepted by many workers but not always in the form of a simple genic change.

In 1950 Boehme[4] concurred with the opinion of Lockhart-Mummery.[21] Gardner[12] in 1951 stated that the pattern of inheritance of polyposis is characteristic of a simple dominant gene. He also observed from his pedigree chart that in every sibship in which the trait was expressed one parent was affected. About half of the children of an affected parent had the disease, while all of the children of those parents not affected were normal. In 1952 Jackman and Mayo[20] concluded that the disease is inherited and is transmitted, and affects both sexes as a mendelian characteristic. If the gene is dominant, the disease will appear in each generation. If it is recessive, it must be present in both parents to produce the disease. The hereditary transmission showed no inclination for either sex. In ninety-five cases examined, the ages ranged from three to fifty-six years.

Definition. An adenomatous polyp of the rectum or colon may be defined as a proliferation of the structures of the glands of Liberkuehn, which produces sessile or pedunculated growths which tend to become malignant.

Familial multiple polyposis of the colon and rectum may be defined as widely disseminated benign polypoid disease which runs in certain families, being inherited as a mendelian

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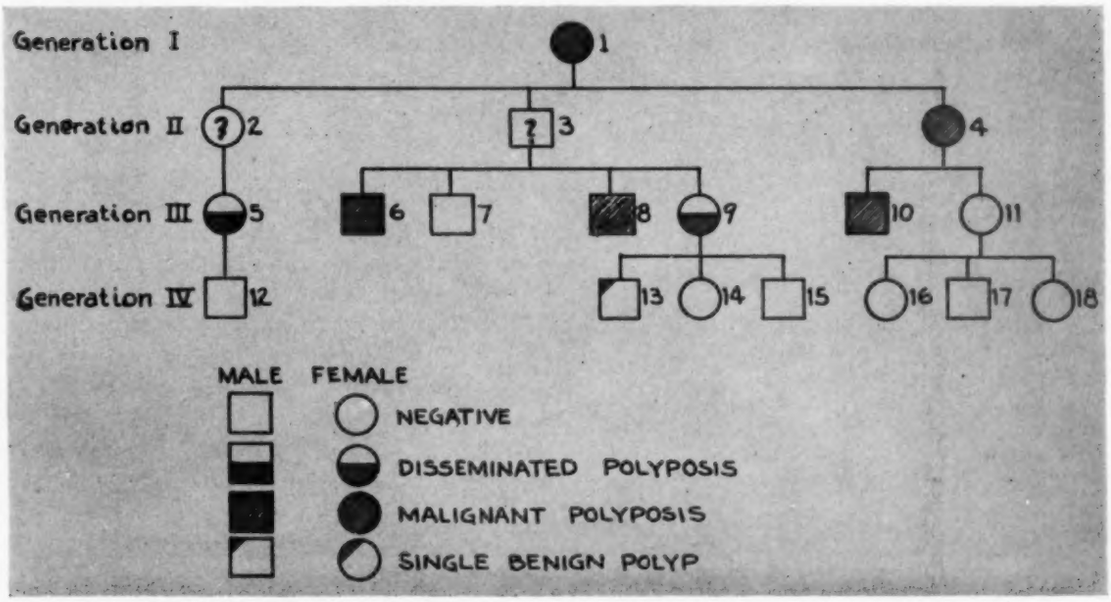

FIG. 1. Family I. Pedigree of family group showing incidence of polyposis and carcinoma of the colon and rectum.

dominant, and which has a strong tendency to transform into a malignancy.

Etiology. This author concurs with Lockhart-Mummery[21] who is of the opinion that: "Tumours are the result of a genetic change in a normal growing somatic cell. The explanation is applicable also to adenomatosis, in which disease the genetic defect appears to be a tendency to a more rapid growth of the intestinal mucosa, leading first to hyperplasia and later to adenomata. This defect may be explained as a result of a gene mutation, and the liability to it is handed on from one generation to the next. The more rapid growth of the intestinal mucosa increases the probability of a further gene mutation responsible for malignancy, a change which can only take place when cells are undergoing mitosis." Like Lockhart-Mummery,[22] the writer also believes that the disease is due to a gene mutation inherited as a mendelian dominant which may be transmitted by either sex.

Relationsbip of the Disease to Inberitance. The genetic factor is defined as follows: A dominant characteristic is a trait which is transmitted as a whole. One having a dominant characteristic would have a parent with this characteristic, which tends to be transmitted down the generations without a skip and which is inherited as a unit.

We note in the historical background of familial multiple polyposis, as shown elsewhere in this thesis, that earlier authors proved it to be present in several members of one family and that it was found in succeeding generations.

The studies which we have done for this paper were based on an aggregate of forty individuals in three families, one of pure English, one of pure Scandinavian and one of pure German descent. This would indicate that the disease occurs in different nationalities.

SUMMARY OF PEDIGREE CHARTS

Family I. The study of Family I covered four generations, consisting of nine males and nine females, ranging in age from fifteen months to fifty-three years. (Fig. 1.) The member of the first generation has the disease In the second generation, there are two questionable cases, which may be explained as possible "lack of penetrance" or as cases in which the condition was present but not demonstrated; and a third member of that generation who definitely had the disease. In the third generation we find that the two questionable subjects had siblings who had the disease, one having one sibling who developed the disease and the other having four siblings three of whom developed the disease. In the fourth generation none of the siblings have developed the disease although a single cecal polyp was found in one. The author believes that the evidence in the last generation, which shows all negative findings, is inconclusive

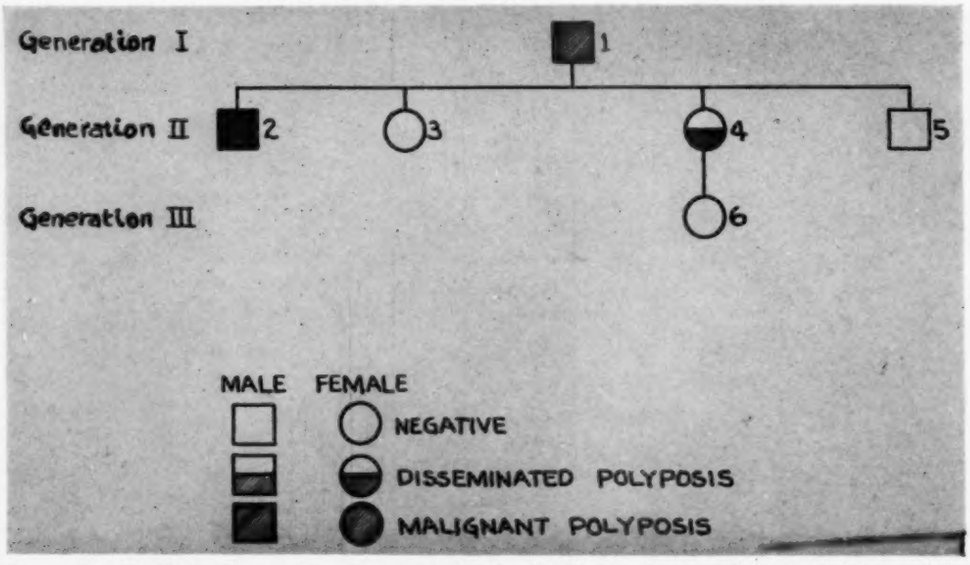

FIG. 2. Family II. Pedigree of family group showing incidence of polyposis and carcinoma of the colon and rectum.

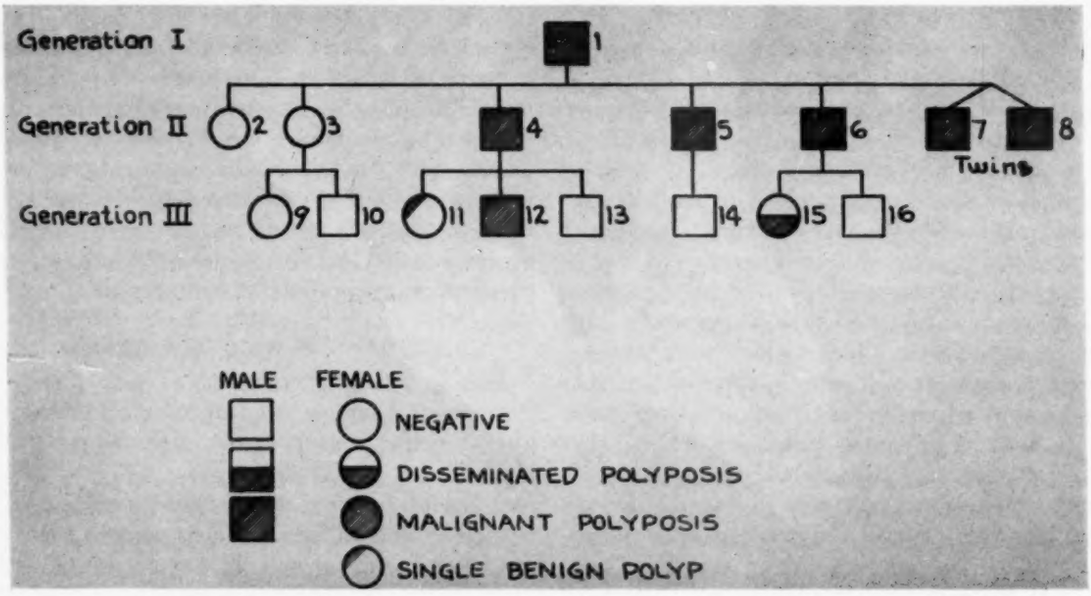

FIG. 3. Family III. Pedigree of family group showing incidence of polyposis and carcinoma of the colon and rectum.

because of the youth of the members of that generation—three under seven years of age and the remaining four under fourteen years of age—all below the age of puberty.

Subjects 2 and 3 could be explained on the theory of "lack of penetrance." The author takes for his authority Gates[13] who writes: "Many cases are now known in which an abnormality is strictly dominant in some pedigrees and sometimes skips a generation in others. Several explanations of this phenomenon of skipping a generation have been offered. It is now known as 'lack of penetrance,' which has become a very important principle in human genetics. Penetrance is an all-or-none reaction. The gene is present in the germ-plasm, as shown by its transmission to the next generation, but for some reason it has completely failed to express itself in the soma."

Family II. The study of Family II covered three generations consisting of three males and three females, ranging in age from six years to

thirty-seven years. (Fig. 2.) The member of the first generation had the disease. In the second generation two members had the disease and two did not. In the third generation only one member was examined. She was free of the disease but is below the age of puberty. Her mother has the disease.

Family III. The study of Family III covered three generations consisting of eleven males and five females, ranging in age from eleven years to forty-nine years. Seven males and one female had the disease and one female had a single polyp at the age of eleven. (Fig. 3.)

The member of the first generation had the disease. In the second generation five members, including identical twins, had the disease and two did not. In the third generation one sibling each of two proven cases had the disease. Another sibling, of one of these parents, had a single polyp at the age of eleven. The remaining members were found to be free of the disease.

Comment. The pedigree charts show that the disease is present in succeeding generations; that the disease is present in at least 50 per cent of the subjects, excepting in the fourth generation of Family I and the third generation of Family III. This indicates that the disease is mendelian dominant, as has previously been shown by Dukes,[9] Lockhart-Mummery,[21] Hoxworth and Slaughter[17] and Gardner.[12] The pedigree charts further show that the pattern of the inheritance of multiple polyposis is characteristic of a simple dominant gene.

Like Gardner,[12] this writer observed in his pedigree charts that in every sibship in which the trait was expressed one parent was affected; and about half of the children of an affected parent had the disease, while all of the children of those parents, not affected, were free of the disease.

CONCLUSIONS

This paper presents the following conclusions: (1) That familial multiple polyposis follows a hereditary pattern and tends to develop in succeeding generations of the same family tree; (2) that familial multiple polyposis is a mendelian dominant disease; and demonstrates the practical application of the mendelian law of heredity in medical practice; and (3) because multiple polyposis develops in the colon and rectum with a definite familial tendency, it should be designated, "familial disseminated polyposis coli."

November, 1953

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DISCUSSION

Willard H. Bernhoft (Buffalo, N. Y.): Dr. McCarty in his study has further substantiated the genetic factors in the disease, multiple polyposis or adenomatosis. Since the early work attention of the medical profession has been attained, first by careful and complete family histories and second by thorough sigmoidoscopic study, followed by barium enema and air contrast x-ray examination. Men in the field of genetics have little doubt that adenomatosis is a dominant type of inheritance. Gardner and his associates, in the laboratory of human genetics at the University of Utah, have been instrumental in establishing a clinic for the detection of multiple polyposis of the colon and rectum. This has been set up in connection with the Division of Oncology at Salt Lake General Hospital. They are following all members of families in whom multiple polyps of the colon and rectum are found. Their incidence of these polyps is better than 50 per cent in the various members of the family.

In the series reported by Dr. Descum McKenney 42 per cent of the members of the families reported had the disease. In connection with this discussion, I wish to bring out two points: (1) that the potentialities lie in the intestinal mucosa at the time of birth, even though clinical expression may not be manifested until eight or ten years of age. This was brought out in McKenney's series. Therefore, it is important that members of an infected family be examined early in life and at regular intervals. (2) I am not bringing this up to cause confusion in this disease, but as a question to Dr. McCarty. We have had the experience of finding one or two adenomatous polyps in the colon and rectum with the remainder of the bowel completely normal. The picture was not that of true familial polyposis. Family histories revealed that either the mother or father died at an early age from carcinoma of the colon or rectum. Despite the clinical picture should this be regarded as familial polyposis inherited by either a dominant or recessive gene?

Robert T. McCarty (closing): When we originally made these studies, we investigated not only the genetics of this disease but also studied when the disease developed into cancer; and we came to the conclusion, as of course is already known by some of the excellent work done by Dr. McKenney, that these people developed cancer at a very early age and will die of cancer at a very early age.

We reported only on cases which we actually studied, not those on which we had histories only. We actually had to demonstrate the presence of the disease by sigmoidoscopic examination or barium enema. The other thing I would like to point out is that the disease is not a congenital disease but is a familial disease. In our experience we found no youngsters who had the disease at the time of birth. There was only one (a girl, No. 15) in the last group whom we examined at the age of fifteen. She was just beginning to show evidence of the disease.

All of these people will develop carcinoma and will die of their carcinoma unless a colectomy is done. I was very happy to hear Dr. Lahey mention his feeling toward this disease, namely, that a total colectomy should be done. We had one patient at the age of fourteen who had an ileosigmoidostomy and his rectum remained. At the age of nineteen he had definite carcinoma and then had to have the perineal resection done.

In answer to Dr. Bernhoft's question, I believe that if he has a case in which polyps were demonstrated, regardless of the number of polyps, and if polyps were demonstrated in a mother and also in a son, then that is a familial type of multiple polyposis. All the other members of the family must be examined and followed very, very closely over a number of years.

THE TRANSITION PERIOD IN PROCTOLOGY*

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RECENTLY a colleague of mine was visiting a hospital in another city and he heard me referred to by a young surgeon there as one of the grandfathers of proctology. When this was reported to me, it came as something of a surprise and shock for it seems not so long ago that, along with Dr. Buie, Dr. Crookall, Dr. Goldman and Dr. Ricketts, I was one of the youngsters in this group. That was in 1922 when we were all made Associates of the Proctologic Society at its twenty-third annual meeting in Saint Louis. At present there are only seven others who preceded us into membership. These are Dr. Walter A. Fansler, Dr. W. Oakley Hermance, Dr. Louis J. Hirschman, Dr. Charles E. Howard, Dr. Joseph F. Saphir, Dr. Emmet H. Terrell, and Dr. Frank C. Yeomans. So we twelve are, whether we like it or not, the elders of this organization; and we might as well resign ourselves to being regarded as grandfathers by those who have joined us during the last few years.

If my contemporaries and I seem as grandfathers to you, the men who founded this Society were as grandfathers to us. Although I never had the pleasure of knowing Dr. Joseph McDowell Mathews, our first president, I did know Louis H. Adler, Jr., William M. Beach, George B. Evans, Samuel G. Gant and J. Rawson Pennington who were among the founders' group. As youngsters, we oldsters of the present derived inspiration and stimulation from them, and we have a duty and responsibility to pass on something of the spirit and enthusiasm that they bequeathed to us.

The great honor you have bestowed on me in inviting me to deliver this fourth Biennial Mathews Oration is one I don't deserve, but I am deeply and humbly grateful for it. It is, I believe, a tribute to age rather than achievement; nevertheless, I shall do my best to impart to you something of the spirit, as I understand it, that motivated Dr. Mathews and the others who established this organization. The facts concerning his life and works and the past history of the Society have been amply reviewed in other recent addresses, so there seems no need to reiterate them at this time.

I have chosen rather to present a somewhat more personal view of the present status of our activities and progress and to render my own interpretation of them. It seems to me that the dozen of us who are now the "old men" to the rest of you represent a transition group between the proctologists of the past and those of the future. For this reason, it may be worth while to offer a few comments as to how we view our Society and our specialty today, in the light of what has gone before and what, as we see it, remains to be done. It is the prerogative of grandfathers to indulge in reminiscence and to be generous with precepts, so I hope you will bear with me if I inject some of both of these grandfatherly ingredients into this appraisal.

Transitions often are not noticeable or evident until they have happened. The people of the Middle Ages didn't know that they were acting out a period of transition. And from my own experience, I can testify that I was so busy during that metamorphosis from youth to maturity to senescence that its occurrence was ignored, despite increasing baldness and bridgework, until I learned by hearsay that I was one of the "grandfathers" of proctology. Like individuals, organizations also progress from youth to maturity by gradual degrees, and only one who has the perspective of a relatively long span of years can appreciate the change that has occurred. This longer view of the past perhaps gives a little clearer picture of the present and some license to prognosticate the future.

The two essential features of all progressive human activity are self-improvement and cooperation which are practiced not for their own sakes, but for the benefit of others. The founders of our Society demonstrated their humanitarian purpose in their desire to improve the practice and teaching of proctology and to raise its prestige among members of the medical profession, so that patients with anorectal diseases might receive better care.

* The Joseph Mathews Oration.

They themselves did a very great deal to advance their aims and they inspired those of my generation to carry the work further, but the task is still far from completed, as we all know. It remains for you younger men, and perhaps for those who will come still later, to expand the facilities for the practice and teaching of proctology to the point that the services of specialists in this field may be available to all who need them.

In his presentation of the early history of the American Proctologic Society, written in 1910, Lewis H. Adler, Jr., made a statement that has been quoted before, but it is worth repeating: "As the surgeon has rescued surgery from the 'Society of Barbers and Bathers,' and the obstetrician, the practice of midwifery from the ignorant and often grossly careless midwife, so the proctologist, largely by means of this organization, has advanced diseases of the rectum and sigmoid from the domain of quackery to a recognized specialty and has removed from the hands of the charlatan, to a large extent, a fertile field for playing upon the credulity and ignorance of the populace."

It is now forty-three years since that was written, and much has been accomplished since then in advancing proctology as a recognized specialty, and yet the irregular practitioners and the advertising clinics who treat anorectal diseases still flourish in every city in the land. This fact, by itself, is sufficient evidence that the work of this organization is far from complete, and that much effort must yet be expended before the aim of our founders can be adequately fulfilled.

From the lofty pinnacle of our specialized professional status we are prone to assume an attitude of pious indignation or superior disdain toward the irregular practitioners who encroach on our field of activity. This is warranted, of course, in view of the results of such treatment that we often see. But instead of blaming these men and groups and condemning them as charlatans, perhaps it might behoove us to take stock of ourselves in an effort to see how much of their prosperity we are responsible for. Such practice is a purely commercial proposition; and it is axiomatic in business that if it does not serve a need or render satisfactory service, the enterprise fails. These irregulars and quacks must render some benefit to the patients who patronize them or they could not keep going year after year. As I see it, their continued presence and practice in our communities indicate that we of this Society have much yet to do in educating both the medical profession and the public as to the proper care of anorectal diseases, and in creating greatly expanded services and facilities for the provision of such care. So long as skilled proctologic service is not generally and universally available, and so long as the public remains unaware of its benefits, the "pile doctors" will prosper.

The desire for increased learning and skill motivated the collaborative effort which culminated in the founding of this Society in 1899, and through the period dominated by the charter members and their immediate successors and through that of my own generation there has been great advancement in the surgical technics and the clinical methods used in the treatment of anorectal diseases of all types. A great part of this progress has been stimulated and facilitated by the exchange of knowledge both in formal programs and informal discussions at the meetings of this organization and in the fellowship that has developed among those practicing our specialty in all parts of the country. In looking back, I should say that we have cooperated well with each other in ways that have contributed toward the enhancement of our skill as individual practitioners. This, in turn, has done much to increase the prestige of proctology among other medical and surgical specialties, and has encouraged us to increase our efforts to raise the standards for our group so that they are comparable to those demanded in other special fields. To train men who can meet those standards has necessitated more and better teaching and facilities for hospital training. The result of all this activity has meant an increasing number of skilled proctologists who are fitted to make their own particular contribution to the improvement of medical care generally.

When one compares the present with the situation thirty years ago, it is evident that great strides have been made in our knowledge, our teaching and our practice. But in spite of all we have learned, or perhaps because of it, there is still so much more to know. Although we have trained a good many men in our special technics and skills, we should be training many times more than we do; and although our practice as individual specialists has

reached a high level of excellence in many instances, there is still room for improvement in our clinical methods, and much opportunity for expanding our services through collaboration with general practitioners and other medical specialists, and much that we could do to foster the art of medicine in dealing with our patients with more concern for their individual problems and their personal welfare.

Before I go on to point out some of the ways in which I believe progress will come through the cooperative efforts of the members of this Society, it might be well to glance at one or two facts that furnish some index of the progress that has been made to date. Perhaps the most palpable evidence of our present healthy status is the growth of our membership through the years. Attending the first meeting of the American Proctologic Society in Columbus, Ohio, in 1899, were eleven men, and three others were listed as charter members, absent from the original session. In 1910 the membership was listed as nine honorary fellows and thirty-seven active fellows, of whom thirteen were credited as charter members. In 1920 there were seven honorary fellows, thirty-seven active fellows and twelve associate fellows. By 1930 the Society had grown to include ten honorary fellows, three honorary associates, fifty-three active fellows and thirty-five associate fellows. During the next decade there was considerable expansion, so that the 1940 census showed nine honorary fellows, four honorary associates, seven senior fellows, seventy-five active fellows and ninety-five associate fellows. The decade just past has seen even more rapid growth, and the membership record for 1952 revealed fifteen honorary fellows, eight honorary associates, twenty-five senior fellows, 118 active fellows, 211 associate fellows and 181 affiliate members, making a total of 535, exclusive of the honorary fellows and the honorary associates.

Although none of us is satisfied with the extent of the teaching program in our medical schools and hospitals, the progress, as a whole, in this department of our activities has been heartening, when we remember, as many of us can, that in former years there were only a very few schools in which proctology was presented as a separate subject, and that the first residency in Proctology was founded by L. A. Buie to be followed soon afterward by the one established by Dr. Bacon at Temple University.

In appraising the progress of our educational program, we should also recall that it was not until 1878, that is, only seventy-five years ago, that Joseph M. Mathews began to specialize in diseases of the rectum and colon, and that he began teaching his subject at the Kentucky School of Medicine in 1880. In 1893, Tuttle established a department on diseases of the rectum and intestinal tract at the New York Polyclinic Hospital, and in 1897 Pennington began teaching proctology at the Chicago Clinical School of Medicine and Surgery. In noting these pioneer educational efforts, I want to point out a little known historical sidelight about my own home town of Omaha. In the catalog of Creighton University Medical School for the year 1897–98, R. D. Mason is listed as Lecturer on Diseases of the Rectum. The catalog of the following year, 1898–99, lists him as Professor of Diseases of the Rectum, giving lectures on rectal surgery one hour a week to fourth-year medical students. He was listed as Professor of Rectal Diseases again in 1900 and that year his course was described as follows: "Rectal Surgery: This course also includes certain diseases of the rectum, the treatment of which is not surgical—one hour a week. Professor Mason was also listed on the Dispensary Staff in the catalog of 1900–01. He continued as Professor of Rectal Diseases at Creighton University until 1909. The teaching of proctology was then omitted from the curriculum until the school year 1915–16. when E. DeLanney became Instructor and later Assistant Professor in Proctology. He dropped out in 1918, and I began teaching Proctology at Creighton University Medical School in 1921. This record shows that from 1897 to the present, there have been only ten years in which Proctology was not taught as a separate course at our Medical School. My local pride also prompts me to mention that Charles C. Allison, also a member of the Creighton Medical School staff, was among the original members who attended the first meeting of the American Proctologic Society in 1899. Although his paper was not mentioned in Adler's historical sketch in the 1910 Transactions, the account of the meeting published in the Ohio State Journal of June 8, 1899, included the fact that Dr. C. C. Allison of Omaha presented a talk on "The Limitations of the Kraske Operation."

When we consider that, as a professional

group, we are only a little more than fifty years old and that the individual pioneers began their work no longer ago than the span of a human life, we can feel some pride in the scientific standards that have been established for our group and in the fact that the subject of proctology is taught in numerous medical schools and that there are thirteen hospitals offering nineteen openings to residents who wish to become specialists in the treatment of anorectal and colon diseases. But when we compare the number of openings available for trainees in proctology with the opportunities for training in other specialties, then we realize that we have a long way to go before we attain to the stature of the older special fields.

In looking back over the active period of my own generation, the fact that we symbolize the transition from the old-style practice of proctology to that now current is shown most strikingly in the improvement in professional standards, which has finally culminated in the establishment of a Board of our own for the certification of specialists in anorectal diseases and in proctology. I am aware that some of the members of this Society have been disappointed that they have been unable to meet the standards set up by the Board in regard to special training, even though they have been and are doing acceptable and even excellent work as proctologists in their communities. All of us in my own generation, and many of you who have come into our Society later, lacked the opportunity for specialized hospital training in proctology that is now demanded as a prerequisite qualification of candidates for the Board examinations. Because of this anomalous situation some apparent injustices have been done in individual cases, but such ironies are always inherent in any period of rapid change. In formulating the qualifications for certification the Board members have been motivated by the will to improve our specialty as a whole by setting up standards that are comparable to those of other surgical and medical fields and that meet the demand of the twentieth century as to skill and special knowledge. In any program of this kind, the planning must be toward the future instead of the past, and this is always bound to leave some individuals stranded in the middle. This is not to say that those of us who have participated in trying to solve the many problems concerned believe that the present program is the ultimate, but it was the best and the fairest that could be devised at the time in reconciling the pressures from without and from within our own group. No doubt, the accumulation of experience will indicate the need for certain modifications that may overcome some of the present difficulties and objections to this schedule of requirements.

In looking toward the future from where we now stand, it would appear to me that the aims and goals of our Society remain the same as they were when our Founders met and elected Dr. Joseph M. Mathews their president in 1899. They wanted to add to their own knowledge of diseases of the anus, rectum and colon, to expand and improve their teaching of the subject, and to devise better methods of treating patients suffering from diseases at the terminus of the digestive tract. And we today want to do the same thing. They believed they could promote their purposes by cooperating with each other in a special society, and our present growth and prestige indicate that they were right. Our future progress will come through the same type of collaborative activity carried out in the same humanitarian spirit. Only the methods and the scope of such collaboration will have to be altered and expanded to meet the conditions of our work and life today and in the years ahead.

In other words, in our future growth we shall be doing the same things, but in a different way, with ever increasing integration of the activities within our own body and those of other members of the medical profession, with the ultimate aim of offering better medical care to more and more people. As I see it, there will be three facets to our work, investigative study and research of both basic and clinical types; expansion of educational facilities and improvement in the quality of our teaching, and increased collaboration with other specialists in the integration of facilities for better clinical practice. I believe that these three facets of our activity must be carried out simultaneously, not as parallel functions, but as related and inseparable parts of an organized scheme, in which each of these features, research, teaching and practice, contributes to and is enhanced by the others.

Although, no doubt, important new discoveries will continue to be made by certain gifted individuals, it seems apparent that the research activities of the future will show a

great trend toward collaborative studies. Our Society could do more than it has done to further cooperative effort along this line. For example, when a new surgical technic or therapeutic method is suggested or introduced into the literature, it seems obvious that if there were a special committee of the Society which could act as a clearing house or central bureau, effective answers on many of these innovations might be forthcoming much more promptly and the information thus accumulated would have much more scientific value than the individual separate studies, with their conflicting conclusions, that eventually are reported. This means that in the study of a new type of operation, some standard criteria as to the technic and the adjuvant measures used might be set up as a guide to be used by numerous investigators whose data then would be suitable for some kind of statistical evaluation. As such matters are handled now, there are often so many variations in the technic or method, as actually administered by different hands, that the results obtained are not suitable for comparison in a scientific sense. This then leads to a multiplication of conflicting reports in the literature which often confuse, rather than enlighten the conscientious practitioners who are anxiously trying to keep abreast of the latest developments. Such confusion leads sometimes to the delay in acceptance of an improved method, because of early disparaging reports based on insufficient and hasty studies or, conversely, it may result in premature and widespread use of a method or drug that eventually is discredited as ineffective or even dangerous.

Besides some correlation of clinical studies in the evaluation of new methods, instruments and surgical procedures, a central clearing committee on research might also stimulate coordinated investigations on a wider scale than would be possible in any one institution on certain problems. Among those that come to mind that would be suitable for an approach of this kind are basic investigations into the nature of cryptitis and pruritus which might furnish an improved rationale for treatment, studies on anal fissure, on the relationship of anorectal obstruction to diverticulosis, studies on the type and incidence of anorectal disease in patients with diverticula, and widescale controlled studies on the use of chemotherapy and antibiotics and perhaps the local use of cortisone in anorectal inflammatory diseases to see whether some of these conditions which have been regarded as requiring surgical treatment may be successfully managed by conservative medical means. Perhaps the role of allergy in some of these conditions might also be investigated. The otolaryngologists have already converted many "surgical" lesions into "medical" ones in the type of mucosa with which they deal. So it is not beyond the realm of possibility that with properly controlled and correlated investigations, we might be able to do the same in connection with inflammatory lesions of the anal mucosa. In passing, I should like to comment that the solution of many of our basic clinical problems in proctology will come only in combining the data of clinical observation with experiments on animals and the study of basic biochemical and biophysical phenomena concerned in the pathologic process under investigation. This, in turn, calls for teamwork with men working in the basic sciences and in related clinical fields.

Such research studies should be emphasized as a part of the educational program in our teaching centers, but could be greatly enhanced by the practical observations that proctologists in private clinical practice might contribute by some concerted effort organized through our Society. In our teaching of the young men who are to practice proctology in the future, we should do everything we possibly can to stimulate their intellectual curiosity by fostering experimental and clinical research projects to which they can contribute and in which they can participate while they are in training. This is one of the ways to avoid developing a group of merely highly skilled technicians, instead of the true physicians they ought to be. In view of the fact that our specialty is still greatly undermanned, so far as the needs of the public are concerned, those of us who are practicing proctology today should overlook no opportunity and spare no effort to teach the interns, residents and nurses in our hospitals all we can about the proper treatment and care of patients with anorectal diseases. The more knowledge thus disseminated and the greater the appreciation by other members of the medical profession of what can be accomplished with proper methods and expert skill, the greater will be the number of patients relieved of needless suffering. This, in turn, will enhance the prestige of our profession, attract more young physicians into

this field, and will bring more work and greater opportunities for service to all of us.

In the period of transition through which we have been passing, the empirical methods used by the old-style proctologists have been replaced, in large part, by more precise and scientific methods of diagnosis and treatment of anorectal diseases and we have added enormously to our knowledge of the pathologic processes underlying them. During the fifty years or so that our Society has been existent, the advancement of the science of medicine has been more rapid than at any other time in history. Those of us who have been in active practice during this era have seen an unbelievable change in this respect and have reason to feel some satisfaction that we have witnessed and participated in the prodigious development and expansion of our knowledge. Although we can feel a certain satisfaction in all this scientific achievement, many of us are realizing more and more that in developing these complicated skills that require a high degree of specialization, we have lost something precious and important in the administration of medical care. We have classified and catalogued and distinguished an enormous variety of lesions and diseases, but in doing this we have sometimes—too often, I'm afraid—minimized the attention that we have given to our patients as human beings with individual problems and difficulties. Too often our interest has been centered solely on a particular part of the body and we have treated the pathologic process there discovered, often with good effect, but have failed to correlate this lesion with remote symptoms quite possibly related to it, and many times the patient has remained sick, despite our successful specialized treatment. We have been prone to be more interested in the disease than i the patient's illness as a whole.

Those of us who have reached this grandfather stage they tell us about, with our tendency to reminiscence, can recall men like the founders of our Society and older doctors we knew in our youth whose technics would be criticized by any one of our interns just out of medical school, and yet they knew something about making sick people well that in this transition period we have tended to ignore or minimize in our zeal to keep up-to-date with the latest scientific methods. With the passing of the years and our own increasing knowledge through extensive experience, some of us are gradually placing more and more value on this somewhat intangible factor of percipience or apperception or sympathetic appraisal of the patient and his problem that our predecessors and preceptors demonstrated so well. This is the hardest kind of thing to impart to the younger men in training, and perhaps there is no way to do it except by example. Perhaps those of us who try to impart this added factor to our students, and become discouraged when they do not seem to grasp its meaning or importance in the practice of medicine, may be accomplishing something in this direction, after all. In saying that, I mean that perhaps this added intangible factor, composed of insight into the patient's problem and concern for his welfare, in a very personal sense, may come only with experience, and then the examples furnished by our teachers begin to bear their proper fruit. The teachers of mine that I now hold in mind as models to follow in this respect in the healing of the sick probably could not see that I was absorbing what they were trying to impart at the time. I like to think that those of us oldsters who try to demonstrate to our students and associates that we are physicians first, and specialists afterward, are not wasting our time and that their patients in the future will benefit from this teaching.

At any rate, I believe that it is incumbent upon all of us who are engaged in teaching to manifest in all that we say and all that we do that true concern for the individual patient is the basis of all good medical practice, and that without the keen apperception and acumen and insight that constitute the art of medicine, our technical skills will not cure the patient, but will merely alleviate his disease.

ROENTGENOLOGIC EXAMINATION OF THE BLEEDING BOWEL

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Kansas City, Missouri

THE greatest opportunity for the reduction or early detection of all internal cancer lies in education of the public concerning the significance of gross bleeding from the bowel. Polypoid adenomas are precursors of carcinoma. The preponderance of these lesions in the left colon results in frequent gross bleeding as the result of fecal irritation. A backward glance before flushing the stool should be the slogan for public education. Every patient should be instructed to observe his stool. We are finding more and more patients who have discovered bleeding as a result of such instruction given during visits for unrelated conditions.

TABLE I
CLASSIFICATION OF REFERRING PHYSICIANS IN 120 CASES OF VERIFIED ADENOMA

	1947	1948	1949	1950	1951	1952
Proctologist	..	1	24	30	16	23
Surgeon	..	3	3	2	4	4
Internist	..	..	3	1	3	2

Examination as soon as possible after bleeding should afford a clue as to the origin. Of course the great majority of these cases will be readily classified as anal or rectal disease. Further study by barium enema is indicated when the visible lower segment of the bowel does not offer satisfactory etiology. If blood streaking is noted as high as the sigmoidoscope can be passed, you will be justified in expecting a positive diagnosis from the radiologist in about 95 per cent of the cases. The remaining 5 per cent may be further reduced by studies of the stomach and small bowel and by investigation for systemic diseases such as leukemia.

In 1947 Dr. Raymond Morrow gave me his frank opinion of any radiologist who complacently reported negative findings in the colon in the presence of gross blood streaking. I had certainly placed myself in this category and his remarks struck like a branding iron. Not long after this Dr. Morrow called to warn me that a patient who had bled repeatedly for over a year was to be examined. Vowing to try a combination of all of the suggestions from radiologic literature, we began. The result was my first diagnosis of a polypoid adenoma measuring 1 cm. across the tip with a well defined pedicle 2 cm. in length. Table 1 demonstrates the important role played by proctologists in this series of 120 proven cases of polypoid lesions. In all but four cases there were histories of bleeding or blood detected by sigmoidoscopic examination. Only one case was explored without verification of the x-ray diagnosis. This error was made from a double contrast study without re-examination.

TABLE II
SURGICAL SUMMARY FROM CAMPBELL

	1942–1947	1948–1952
Total laparotomies	200	236
Colotomy, polypoid carcinoma	2	11
Colotomy, polypoid adenoma	0	55
Coagulation, polypoid adenoma (hospital)	27	15
Coagulation, polypoid adenoma (office)	252	299

Table II is a summary of surgery from the office of Dr. Frederick Campbell. This is an illustration of cooperation and interest in cancer prevention and early detection. The value of special attention by the radiologist following careful clinical evaluation is clearly demonstrated. It would also seem that we have little evidence to stimulate any routine type of examination for persons without symptoms.

All too frequently the barium enema is minimized as to its importance and duration. The referring physician should cooperate fully in the mental and medical preparation of the patient. The cooperation of the patient is

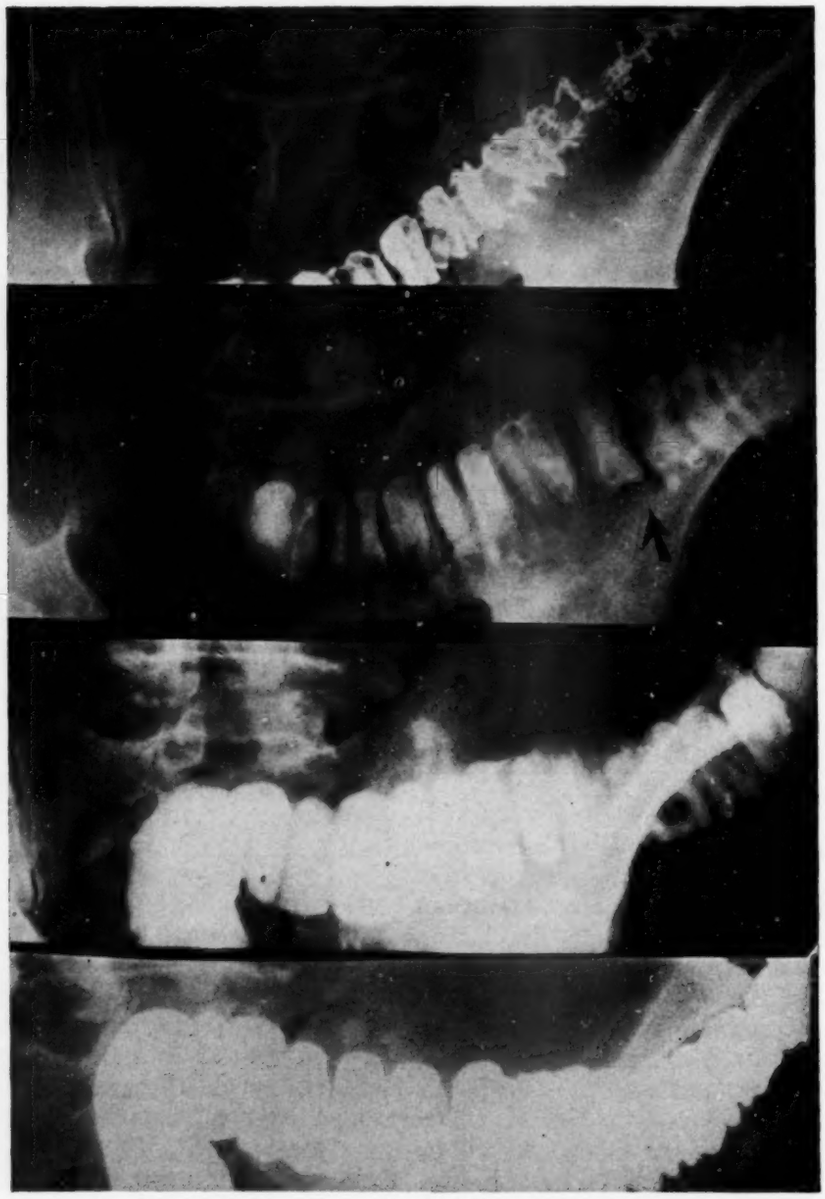


FIG. 1. A, segment of sigmoid visualized with regular barium in 1946. Visualization limited to contour study. B, Comparative study with thin barium in 1948. This scanning enema shows two areas of variations in density that could be organic. C, double contrast study begins to fill diverticula. Only confusion is added to the possibility of adenomas. D, postevacuation film accentuates the diverticula but adds no information as to a definite diagnosis.

essential in a tedious and laborious examination which is uncomfortable. We are best able to approach the matter properly when the patient is referred for a diagnosis and is informed that we are to remain in control until all necessary avenues of approach have been exhausted. The most consistent cleansing of the colon is obtained by the administration of 1½ ounces of castor oil two hours after the evening meal on the day preceding the examination. We have not encountered exacerbation of bleeding which could be attributed to this medication. The addition of plain water enema has been discontinued since troublesome amounts of water were too frequently retained.

X-ray examinations of the colon should not include special consideration of the rectal area. Our reports state this omission and it serves as

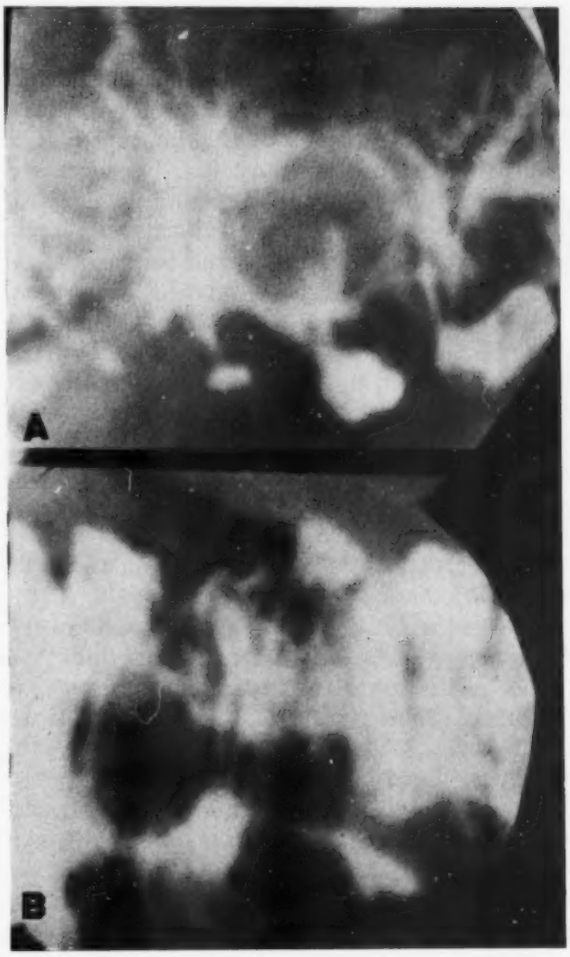
a constant reminder that digital and visual examination of the lower bowel is indicated. The level of examination with a sigmoidoscope varies greatly from one patient to another and even from time to time on the same patient. The average visualization includes the recto-sigmoid junction and varying amounts of the lower one-third of the sigmoid. In one child the sigmoidoscope was passed until the tip was palpable in the left upper quadrant. However, by x-ray examination, with the scope in place, an adenoma of the lower one-third of the sigmoid was not reached.

The radiologic literature contains many articles praising single types of x-ray procedure. The variations in the gross pathologic picture, mucus and irritability will account for the success or failure of any single type of examination. For the specific cases under discussion we are convinced that a routine embracing combined studies is indicated for an exact evaluation.

The study is begun with a scanning enema made possible by the use of the newer finely divided barium powders. A thin suspension of barium yields optimum density and contrast for both fluoroscopic and film studies. The maximum intraluminal evaluation is afforded by being able to see through the bowel. (Fig. 1.) The colon should be filled slowly and intermittently so that oblique viewing and spot pressure fluoroscopy can be utilized. The most satisfactory visualization is obtained with an even distribution of barium. Overdistention should be guarded against as the visibility of superimposed loops is decreased and regurgitation into the terminal ileum may obscure further verification of disease by a second enema.

Following partial evacuation of the barium a double contrast study is made. The air is introduced under fluoroscopic observation and complete filling is obtained. Again overdistention is guarded against. This particular phase of the examination depends on so many uncontrollable factors, such as the degree of evacuation and mucus, that its importance in specific cases may vary greatly.

The two routine postero-anterior films and any spot films that have been taken are now developed and carefully studied. It is this information that will guide our attention in further types of study. Usually we are not able to say that every area of the colon has been completely visualized for minute pathologic conditions. Lesions are prone to be obscured in angulations and in superimposition of the rectum and sigmoid. Even though one definite



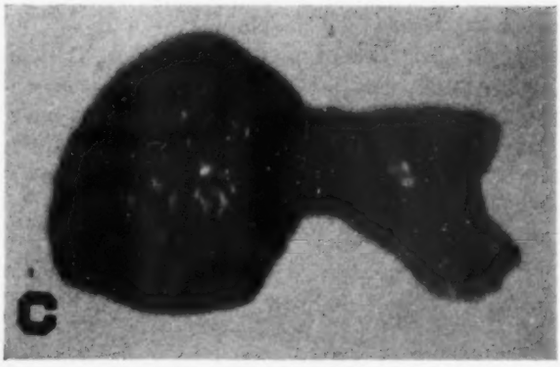


FIG. 2. A, spot pressure demonstrates tip of polyp and diverticula. B, spot pressure slightly reduced and the pedicle well demonstrated. This lesion corresponds to the well circumscribed decreased density superimposing the anterior portion of the ileum in Figure 1B. C, Photograph of gross specimen; pedicle 1 cm. in length and tip 1 cm. in diameter.

lesion is observed, we must entirely exclude the ever present possibility of multiple lesions.

The third filling of the colon is made with a thick barium mixture using regular barium. The increased viscosity of this mixture results in greater distention of the colon. The increased density will be sufficient to outline the mucosal pattern in area of reduced caliber. Spot pressure fluoroscopy is repeated and this segmental examination of 3 inches of bowel at a time, under varying degrees of pressure, is the most dependable portion of the examination. (Fig. 2.) A lesion projecting into the lumen of the bowel may be verified by the demonstration of a pedicle, by demonstrating continuity with the mucosa in tangential projection or as a last resort by its persistence throughout multiple fillings. Seventy-five per cent of our lesions were recorded in only a diagnostic manner by spot film technic.

Where there is definite bleeding and all of the foregoing studies fail to reveal abnormalities, we do not hesitate to prepare the patient and repeat all or a portion of the examination in a few days or a few weeks. In some cases in which we have wrestled a redundant sigmoid low in the pelvis we have found this loop easily maneuvered into the mid-abdomen a few days later. Adenomas of 1 cm. may be missed at one time yet be readily visible at another time, probably because of variations in the position of the bowel.

Diverticulosis of the bowel should be accepted as a cause of bleeding with great hesitation. Both carcinoma and adenoma are encountered frequently in conjunction with diverticula. A well localized distortion of the bowel contour in the area of diverticula must be carefully studied. If such a lesion is encountered with clinical evidence of inflammation, the study should be repeated after subsidence of clinical findings. The extrinsic pressure from diverticulitis in the bowel wall may simulate intraluminal lesions. When carcinoma cannot be excluded, resection is justified.

The radiologist's obligation to the patient should include an explanation of the films. If the study is negative, prompt reassurance is appreciated. When disease is found and surgery indicated, we stand as a neutral party offering information which can be very helpful in a decision to accept surgery.

The radiologist's obligation to the surgeon includes the approximate location of the lesion, multiplicity of lesions, size, configuration and mobility. We must be ever alert for a secondary disorder which might influence surgical approach or procedure, such as malrotation, gallstones, hepatic or splenic enlargement or extrinsic pressure.

CONCLUSIONS

1. Prevention and early detection of cancer of the colon will improve with immediate and thorough investigation of all bleeding. The examination necessary to diagnose early pathologic disease is not practical as a routine procedure.

2. Mental and medical preparation of the patient is of utmost importance.

3. X-ray study embraces a combination of spot pressure fluoroscopy, scanning enema, double contrast, thick barium enema and post-evacuation film.

4. Adenomas are frequently encountered complicating diverticula. If distortion of the bowel is well localized, resection may be necessary to exclude carcinoma.

5. The radiologist should carefully fulfil his obligation to both the patient and surgeon.

TRAUMATIC PERFORATIONS OF THE RECTUM AND DISTAL COLON*

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THE management of perforations of the rectum and distal colon is an infrequent problem in civilian practice. The serious nature of such accidents is demonstrated in reported series with mortality rates of from 20 to 50 per cent.[1-3]

TABLE 1

Clinical Groups	No. of Cases	Deaths	Mortality (%)
Internal trauma			
Perforation during proctoscopy	11	3	27
Perforation by enemas	5	0	0
Perforation by colostomy irrigation	12	0	0
Perforation by intraluminal impalement	5	1	20
External trauma			
Perforation by external force	11	1	9
Perforation by surgery on adjacent organs	6	0	0

Report of Clinical Material. Precise classification of the many types of traumatic perforation of the wall of the rectum and distal colon is impractical. Injury may result from the force of an object against the wall of the bowel from without (external trauma) or from the force of an object against the wall of the bowel from within the lumen (internal trauma). In our experience the majority of perforations have been in the latter category.

This report is based upon clinical experience in fifty cases of traumatic perforation of the rectum and distal colon. Various physicians were responsible for the primary treatment in many cases. There were five deaths, or a mortality rate of 10 per cent. These cases have been classified into the groups shown in Table 1, according to the mode of injury.

General Considerations. The upper one-third of the rectum is intraperitoneal and the lower two-thirds extraperitoneal. With intraperitoneal perforation there is the probability of peritonitis as well as the possibility of injury to other viscera. These perforations are accessible through the abdomen and usually can be closed. In extraperitoneal injuries the perforation is ordinarily not accessible for closure and the retroperitoneal tissues are exposed to continued contamination. This may lead to serious infection in a relatively closed anatomic space. Injury occurred through normal bowel wall in all but four patients. The exceptions were as follows: one perforation of a carcinoma, one ruptured diverticulum, one tear through scar tissue secondary to an old lymphogranuloma venereum infection and one perforation following fulguration of a rectal polyp.

Characteristically, there are no prompt dramatic symptoms when the rectum is perforated. This is true in both extra- and intraperitoneal perforations. No sensation of pain is produced by the act of perforation of the bowel wall. However, gross spillage into the peritoneal cavity of enema fluid, fecal matter or blood may cause prompt and significant symptoms of abdominal pain or discomfort with subsequent signs of peritoneal irritation. In the absence of gross peritoneal contamination, signs of peritonitis may develop within one or two hours, or more gradually over a period of twenty-four hours. Bleeding is rarely a prominent symptom and practically always ceases spontaneously. Signs of shock are uncommon.

Prompt recognition of a perforation and the immediate institution of suitable treatment are of vital importance. Whenever the possibility of perforation exists, every effort should be made to establish the diagnosis at once. In the vast majority of cases the perforation can be palpated within the rectum or visualized through a proctoscope. Barium enema examination is contraindicated but a flat plate examination may at times show evidence of free intraperitoneal air. Any injury which

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could conceivably damage the rectum requires examination of that organ to rule out perforation. This is axiomatic. Valuable time may be lost if one waits for symptoms that make diagnosis obvious.

GROUP I—PERFORATION DURING PROCTOSCOPY

This series includes eleven cases of perforation that occurred during proctoscopy, with three deaths. In every instance the accident occurred at the time of examination by inexperienced members of the resident staff in various hospitals. We know of no instance in which this injury resulted from examination by an experienced proctoscopist. That it should ever occur when ordinary precautions are observed is highly questionable.

Specific errors in technic that were responsible for the majority of these perforations included (1) blind introduction of the proctoscope beyond the upper end of the anal canal; (2) reinsertion of the obturator to overcome "spasm"; (3) attempted forceful dilatation of a rectal stricture with a proctoscope; (4) injudicious use of long, cotton-tipped applicators; (5) excessive fulguration of a rectal polyp; and (6) biopsy of the full thickness of normal rectal wall adjacent to a carcinoma.

Ten of the eleven perforations were intraperitoneal. The fact that perforation during proctoscopy is almost always intraperitoneal is of great significance in the consideration of appropriate treatment.

Diagnosis. In eight patients the perforation was recognized while the proctoscope was still in place and while the patient had no knowledge or suspicion of any untoward occurrence. In some instances the perforation was seen; in others the omentum or small intestine was visualized through the proctoscope. The rapidity of onset and severity of symptoms depend somewhat upon the size of the perforation and the amount of contamination of the peritoneal cavity with bowel contents or blood. With a small tear in a clean bowel there may be a delay of several hours before symptoms of localized or spreading peritonitis develop.

Immediate recognition of the accident permits prompt treatment, even before the onset of any symptoms.

Treatment. Exploratory laparotomy is indicated at the earliest possible moment. Crohn[1] in 1936 found no survivors when surgery was performed more than seven hours after injury. In the eight patients in this series in whom perforation was recognized during proctoscopic examination, laparotomy was performed within two to four hours and the perforation was readily identified and closed. Seven of these eight patients had an uncomplicated recovery. In three instances proximal colostomy or cecostomy was performed as a safeguard. One patient, a seventy-seven year old woman operated upon within two hours of injury, died on the eleventh postoperative day of cardiorenal failure and generalized peritonitis.

In three patients the presence of a perforation was not recognized for more than eighteen hours, when definite symptoms and signs of a spreading peritonitis had developed. Two of these three patients died in spite of intensive use of antibiotic therapy. The single surviving individual probably owed his life to the fact that extensive adhesions had walled off infection in the pelvis. One death was from generalized peritonitis and the second was due to an extensive retroperitoneal infection from an unrecognized extraperitoneal perforation.

Comment. The proctoscopist should always be on the alert for possible accidental perforation. Recognition of a hole through the bowel wall demands that arrangements be made for immediate laparotomy and closure of the defect. Proximal colostomy is not indicated unless there is serious question as to the viability of the bowel wall at the site of repair because of extensive laceration or hematoma formation. All fecal material or blood spilled into the peritoneal cavity should be carefully removed. Instillation of neomycin® solution, as suggested by Poth,[9] may be helpful in preventing peritonitis.

When accidental perforation has not been recognized during proctoscopic examination, the persistent or increasing symptom of lower abdominal pain and the development of signs of peritoneal irritation warrant immediate exploratory laparotomy. Further delay for evidence of signs of a spreading peritonitis, fever and leukocytosis may well lead to fatality.

In the rare instance of extraperitoneal perforation we believe that the extraperitoneal, pararectal dissection necessary to approach the perforation compounds the injury and significantly increases the danger of serious extensive infection. This applies both to approach through the abdomen and through the perineum. Immediate diversion of the fecal stream

by sigmoid colostomy is indicated. The site of perforation has already established external drainage into the lumen of the rectum by the most direct route from the localized area of extrarectal contamination. The natural body defenses may be augmented by the use of penicillin and streptomycin or by intravenous aureomycin.

GROUP II—PERFORATION BY ENEMAS

There were five perforations that followed the taking of an enema, with no deaths. Such perforations may result either by direct injury from the enema tube or from increased hydrostatic pressure. In four of the five the perforation was known to have occurred through normal bowel wall.

Three of the perforations were intraperitoneal, with irrigating fluid as well as feces entering the free peritoneal cavity producing immediate pain and signs of peritoneal irritation. Two of these patients were seen early and had immediate laparotomy with closure of the perforation within eight hours. A third patient was seen after several days and required drainage of a large pelvic abscess.

The remaining two perforations were extraperitoneal. Both these patients had laparotomy and proximal colostomy. In one, perineal drainage was established with excision of the coccyx. A subsequent abscess, however, drained into the lumen of rectum through the anterior perforation rather than into the perineal drainage wound. The same patient developed a disconcerting urologic complication. Two months after the original injury complete anuria developed as the result of complete blockage of both ureters by inflammatory scarring around barium deposits in the retroperitoneal tissues. The nature of the obstruction was determined by surgical exploration. Obstruction was overcome by use of indwelling ureteral catheters and subsequent ureteral dilatation. These five cases call attention to the hazards of perforation of normal rectal wall following a simple enema.

GROUP III—PERFORATION BY COLOSTOMY IRRIGATION

Incidence. Recently Greene[8] reported that this accident is exceedingly rare and that he was able to find only one reported case in the literature during the past eighteen years. The authors wish to report their experience with twelve such perforations occurring during the past ten years.

While this incidence appears high, it actually represents about one perforation per 50,000 irrigations, most commonly occurring early in the patient's convalescence, and three times more common in men than women. The oldest patient was ninety-eight years of age. All previously had had an abdominoperineal resection for carcinoma of the rectum, and the accident occurred in half the cases while the patient was still hospitalized.

Symptoms. The earliest symptom was abdominal pain localized around the colostomy stoma. This usually occurred during the introduction of the irrigating fluid or followed some minor difficulty in inserting the catheter. Signs of peritoneal irritation occasionally developed within a few minutes and in practically all cases were present during the first few hours. Such signs in the majority remained localized, but in a few they were diffuse. Fresh bleeding from the stoma did not occur. Digital examination of the stoma did not in any case reveal an actual perforation. Symptoms of shock were usually not present. During the first twenty-four hours the temperature rose on the average of 1 to 2 degrees and the white blood cells averaged 16,000 to 18,000.

Treatment. No uniform method of treatment has been established. In some, prompt laparotomy was carried out because of signs of marked or spreading peritoneal irritation. In others, conservative treatment under close observation was employed.

A localized inflammatory mass developed in the region of the colostomy stoma in all seven patients treated conservatively. In three cases this subsided following spontaneous drainage of an abscess through the colostomy stoma or adjacent to it.

Laparotomy was performed in five patients. In two, simple closure of an intraperitoneal perforation was done. In one patient the site of perforation was identified in one of innumerable large diverticula of the descending colon. Transverse colostomy was performed in this patient and in a second patient with an extensive phlegmon of the descending colon. The transverse colostomy stoma has been retained permanently in these two elderly patients. In one patient exploration failed to disclose the actual site of perforation because of numerous adhesions and a marked acute inflammatory

reaction. Simple drainage of this general area was carried out and no colostomy was performed. A summary of treatment can be found in Table II.

TABLE II

Conservative treatment only	7
Surgical exploration	5
Simple closure of perforation	2
Proximal transverse colostomy (no closure of perforation)	2
Exploration only	1
Total cases	12

There were no deaths in these twelve cases but an increased hospital stay usually resulted. In no instance was the bowel mobilized and the colostomy revised. This seems a formidable procedure in the presence of local infection, and in the few reported cases has been attended by a stormy convalescence.

The possibility of a strangulated obstruction of small intestine in the left gutter may simulate perforation and must be differentiated from perforation. Two such instances occurred in the authors' experience, with symptoms starting immediately following colostomy irrigation.

GROUP IV—PERFORATION BY INTRALUMINAR IMPALEMENT

Traumatic perforation of the rectum was produced in five patients by the force of long, slender objects (iron pipe, poker, broomhandle and branch of tree) entering the rectum through the anal canal (intraluminar impalement). Perforation was extraperitoneal in four patients and intraperitoneal in one. The single death was that of a thirty-one year old orchestral drummer who sustained a perforation of the extraperitoneal rectum when a wooden seat, supported on an iron pipe, split in two. There was immediate lower abdominal pain and passage of blood per rectum. He was admitted to the hospital within two hours, in moderate shock. A perforation could be palpated in the anterior rectal wall. By proctoscopy a 4 cm. tear could be seen in the anterior wall 8 cm. above the anus. There was moderate bleeding. A catheterized urine specimen showed no blood. Abdominal exploration was done within three hours of injury. A 4 cm. tear of the peritoneum was found deep in the cul-de-sac just posterior to the bladder. Exploration disclosed no other injury to the intestine but there was a tear in the mesentery of the sigmoid colon. A small fragment of wood was removed from this area. The tear in the peritoneum in the cul-de-sac was closed with a running catgut suture, and a sigmoid colostomy was performed. The postoperative course was satisfactory for four days when the patient suddenly went into shock, with increasing cyanosis and rapid drop in blood pressure. He died within a few hours. At autopsy the cause of death was not determined. There was no evidence of peritonitis, hemorrhage or significant infection.

Another illustrative case is that of a twenty-nine year old male who fell against the point of a poker which entered through his anal canal for an unknown distance. The poker was immediately withdrawn and the patient was unaware of any significant injury. Because of some burning on urination and perineal discomfort medical advice was sought forty-eight hours after injury. Examination then revealed a perforation of the anterior rectal wall which communicated with the bladder. An indwelling catheter was placed in the bladder through the urethra and antibiotics prescribed. Fecal drainage continued for a week through the indwelling catheter and then ceased spontaneously. Spontaneous healing of the bladder and rectal perforations took place without abscess or fistula formation.

GROUP V—PERFORATION BY EXTERNAL TRAUMA

There were eleven patients in this group, with one death. Injury was caused by a variety of objects; bullet, buckshot, or shrapnel in eight, knife wound in one, bone fragment in one and a kick in the abdomen in one. The single fatality in the group was caused by an unrecognized perforation of the rectum by a bone fragment in a fractured pelvis. Although a sigmoid colostomy was performed late in the clinical course, the patient died of a retroperitoneal infection.

This group represents a variety of injuries by external trauma with diverse methods of treatment. No routine plan of management was employed, yet the results were entirely satisfactory in ten of the eleven cases.

The following cases typify the type of injury:

Case I. J. F. H., a thirty-six year old woman, was stabbed with a long-bladed knife. When hospitalized five hours after injury a 1 cm. wound of entry was found just lateral to the coccyx. Digital examination of the rectum revealed a moderate amount of old blood in the ampulla. On direct visual examination a 1 cm., slit-like perforation of the posterior wall of the

rectum and a similar perforation of the anterior rectal wall opening into the vagina were found. There was moderate fresh bleeding during examination. No local definitive treatment of any kind was instituted. She was placed on a non-residual diet with sulfasuxidine® by mouth and dicrysticin® intramuscularly. All wounds healed without complication.

Case II. Mrs. B., aged forty-nine, was accidently shot with a revolver. The wound of entry was in the right groin and the bullet could be palpated readily beneath the skin of the left buttock. Both digital and visual inspection revealed a single tear in the posterior wall of the rectum just above the mucocutaneous line. Forty-eight hours after the mishap the bullet was removed and both external wounds were packed open. Colostomy was vetoed. The patient was placed on a non-residual diet with 5 gm. of sulfasuxidine by mouth four times daily and given penicillin. Severe diarrhea developed, presumably from the sulfasuxidine, and on the fifth day she was passing liquid stools through the wound of entry in the right groin. Subsequently an abscess formed in the groin necessitating incision for drainage. By the nineteenth day all wounds were healed without evidence of any residual infection or fistula and the patient was discharged as cured.

Case III. Mr. R., aged sixteen, fell while carrying a loaded shotgun and received the full muzzle blast in his perineum. An extensive destructive wound tore away the anterior one-third of the wall of the anal canal and sphincter muscles, together with 1 inch of the anterior rectal wall. The perineum and 1 inch of the membranous urethra were destroyed together with the prostate, the prostatic urethra and the seminal vesicles. There were multiple perforations of the bladder by buckshot. After initial treatment for severe shock the patient was taken to surgery twelve hours following injury. Laparotomy revealed no intraperitoneal injury. Sigmoid colostomy and suprapubic cystotomy were performed. The large cavity in the perineum was then débrided and left open. Six months later a sliding graft of the membranous urethra was devised and anastomosed to the bladder neck to repair the long defect of the prostatic urethra. The suprapubic cystotomy tube was later removed and normal bladder function and control were re-established. Twelve months after injury epithelization of the large cavernous perineal and anorectal wound was complete. An extensive reconstructive operation was then performed to restore the anal canal, sphincter muscles and perineum. Subsequently the colostomy was closed. Eighteen months after the original accident the patient was entirely rehabilitated, with normal urinary and fecal control.

Five Korean war casualties were seen during evacuation and are included in this group. One twenty-three year old sergeant was shot in the right buttock, the bullet lodging just beneath the skin of the opposite buttock. He was held prisoner for nine days, stripped of all protective clothing and received no food or medical treatment. After liberation a sigmoid colostomy was performed on the eleventh day following injury for a through and through perforation 5 cm. above the anal verge. Bilateral leg amputation was necessary for gangrene secondary to severe frost bite.

GROUP VI—PERFORATION BY SURGERY ON ADJACENT ORGANS

There were six perforations in this group, with no deaths. All were recognized at the time of the accident.

In two a small tear of the anterior rectal wall occurred during perineal prostatectomy. The perforation was closed with a fine catgut suture. In both cases the repair was successful and there were no bowel complications.

A third patient had a small anterior perforation from a transurethral resection for prostatic hypertrophy. Treatment consisted of suprapubic cystotomy with no local treatment of the rectal perforation. The latter closed spontaneously without incident.

A fourth patient sustained a rectovaginal perforation from a radium applicator. This did not close spontaneously but was successfully repaired one year later.

The fifth case occurred during the evacuation of a gravid uterus with a sponge forceps. In so doing, the posterior uterine wall was perforated and several appendices epiploicae grasped in the belief that they were fetal parts. This was recognized and immediate laparotomy was performed. A 2 inch ragged tear in the sigmoid was found and closed. Proximal colostomy was also done as a safeguard.

The final case occurred during a vaginal repair operation when the anterior rectal wall was "dissected widely" before realizing that

the rectum had been entered. Immediate repair of the rectal wall in two layers was carried out and the posterior colporrhaphy continued without drainage. The patient had a spontaneous bowel movement on the fourth postoperative day. Healing was *per primam*.

COMMENTS

Eighteen of fifty bowel perforations in this series occurred during proctoscopic examination or during surgical procedures on adjacent organs. Whether or not such proctoscopic accidents should ever occur is highly questionable. Teachers of proctology have an important responsibility in acquainting the medical student and the hospital resident staff with the hazards of deviating from the basic principles of technic in performing this examination. Immediate recognition of such injury and appropriate treatment are of utmost importance in the prevention of serious complications and possible death. Since perforation during proctoscopic examination is almost always intraperitoneal, immediate laparotomy is indicated. Proximal colostomy is not essential if satisfactory closure of viable bowel wall can be accomplished at the site of perforation.

Twelve instances of perforation followed irrigation of a colostomy. Experience has justified conservative management in the majority of these patients. The site of perforation is frequently extraperitoneal and the resulting localized infection subsequently subsides, with or without local abscess formation. When there are immediate signs of gross intraperitoneal contamination or signs of spreading peritoneal irritation, laparotomy should be performed with either primary closure of the site of perforation or transverse colostomy.

Extraperitoneal wounds of the rectum potentially are as serious as intraperitoneal perforations. This series includes twenty extraperitoneal perforations with three deaths. Such wounds are usually not readily accessible for closure, and proximal colostomy is usually indicated. In occasional instances small, clean-cut perforations will heal without complications and without proximal colostomy.

The advisability of routine external drainage of the presacral space is dubious. The procedure itself causes further devitalization of tissue and extracellular exudation that may enhance the development of infection. Adequate external drainage from the site of bacterial contamination may not be effected, and the insertion of a drain may invite fistula formation. In the group of twenty extraperitoneal perforations three had early drainage of the presacral space. In one instance local abscess formation occurred but drainage was consistently through the anterior perforation into the rectum rather than through the site of surgical drainage. The value of surgical drainage in the other two cases was questionable. Of the seventeen patients in whom surgical drainage was not done, fifteen did not develop evidence of infection in the presacral space. Two fatal cases of retroperitoneal infection did occur; these patients had extraperitoneal perforation of the rectum unrecognized and untreated for two and nine days, respectively.

Antibiotic and sulfonamide therapy have greatly reduced the morbidity and mortality of perforations of the rectum and distal colon.

SUMMARY

The management of traumatic perforations of the rectum and distal colon is reported, including eleven instances of perforation during proctoscopic examination and twelve instances of perforation by colostomy irrigation. In the total series of fifty cases, there were five deaths, a mortality of 10 per cent.

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DISCUSSION

Colin D. L. Cromar (Ottawa, Canada): Dr. Klein's paper was so good, so comprehensive, that I think it has left very little for me or anybody else to say.

Its particular merit is that it gives us an accurate pattern of the type of injury which is run up against in hospitals throughout the whole continent, indeed throughout the world. I am sure that the records of any hospital show evidence of perforations by pitchforks, proctoscopes, enemas and sharp instruments of various types.

Perforation of the rectum is a serious condition. In the old days it was regarded as a certain and efficient method of putting people to death. Impalement on a stake was used 2,000 years ago by the Chinese as a method of execution of criminals; and as civilization progressed, it became reserved for important persons where it was considered undesirable to leave a visible scar on the body.

It is interesting to remember that King Edward II of England was murdered by deliberate perforation of the rectum.

It is rather startling to see the large number of perforations which have occurred during sigmoidoscopy. Personally, I have never perforated the rectum with the sigmoidoscope but I am not at all sure that my time will not come. When I look through operating rooms and see general surgeons passing a sigmoidoscope in patients in the lithotomy position who are straining under general anesthesia, trying to advance the instrument blindly with vigorous blasts of the bellows, I often think that these are the people who have earned perforations of the rectum. In my actual experience it has usually been the experts who have perforated the rectum. I think the reason for this is that the rectum is perforated more easily where it is seriously diseased as in cases of chronic ulcerative colitis, particularly tuberculous enteritis, or where there has been a stricture of the rectum.

I have often wondered what I would do immediately if I did perforate the rectum in passing a sigmoidoscope. I always teach the students something I read in a textbook: If a sigmoidoscope is passed through the wall of the rectum, you should leave it in place, turn the patient over and perform an immediate laparotomy, with the sigmoidoscope passing through the hole indicating the exact site of perforation. This is dramatic and appeals to students, but on candid reflection I cannot help wondering that while the patient is straightened out, put in the ambulance, put on the litter and brought to the operating table, the presence of the sigmoidoscope might not do more harm than good.

I was interested to note in reading Drs. Klein and Scarborough's paper that there was only one perforation in this series which had been caused by the gynecologist doing a perineal repair. It is my impression that in this area the rectum is very vulnerable. I asked one of my gynecologist friends if he ever perforated the rectum while he was doing vaginal repairs. He said, "Yes, of course, we do. We do it quite often. If we do it, the thing to do is simply turn around, ask for a needle with some No. 1 chromic catgut and sew it up. The chances are your assistant won't notice and nothing ever happens."

It seems possible, therefore, that injuries of this type are more common than we realize.

In summary, I think the important thing in perforations of the rectum and colon is to recognize and treat them immediately.

Since the advent of the antibiotics, intraperitoneal perforations can often be sutured primarily and will often do very well.

In extraperitoneal perforations I think there is often the temptation to think that the antibiotics will take care of them and to try to avoid performing a colostomy. I think if we fail to do the colostomy, under these circumstances, we usually regret it. The infection will not take care of itself.

I would like again to congratulate Drs. Klein and Scarborough for a very excellent paper which I think will become a classic on this subject in the literature.

WILLIAM C. BERNSTEIN (St. Paul, Minn.): I was certainly happy to see this paper on the program for this meeting. We in Minnesota seem to have more than our share of rectal perforations. I shall be frank to admit that the diagnostic clinic at the University of Minnesota, during the past ten years, has had three accidental perforations of the sigmoid colon during proctoscopy. We believe that there has been at least some legitimate reason in each case; two of them were in very aged persons and the third was in a patient who was hard of hearing and was very uncooperative. When one does a diagnostic procedure in a clinic and has a group of students around, he often uses more than the average amount of time for the examination. The patients may get very tired of being in the inverted position and may move. That is what happened in all three cases.

All three patients were taken to the operating room within two hours where the perforations were closed. In no case was a colostomy performed. All patients left the hospital within a period of seven days.

A short time ago I was called to see a patient who had undergone a colpotomy by a gynecologist that morning. Later that day she had a massive rectal hemorrhage. That evening we explored her and closed a perforation of the rectum.

I would like to discuss another case which represents a very rare type of rectal perforation. This patient, while housecleaning, climbed up on a chair and fell down. As far as she knows, nothing penetrated her rectum. She fell on her hip, complained of very severe pain in that region and was taken to a hospital. Complete x-ray studies were performed but no fractures could be found. In three days crepitation appeared in her leg. The hospital authorities, learning that there was a probable case of gas gangrene in the hospital, asked that the patient be transferred to the contagious ward at the City Hospital. Further x-ray studies were performed there.

The x-ray man at the City Hospital called our attention to the fact that there was an area of gas lateral to the rectum. Proctoscopy at that time revealed a perforation of the anterior rectal wall 3 cm. above the anus.

X-ray plates of the leg showed large quantities of gas along the fascial planes of the thigh and calf. The radiologist at the first hospital was of the opinion that, since the gas was confined to the fascial planes and was not distributed in a homogeneous manner in the muscles, we were not dealing with gas gangrene but rather with an extravasation of gas into the leg from above.

Treatment of the patient consisted of the following procedures: The leg was opened extensively to permit the gas to escape. The abdomen was opened and explored. No perforation or peritonitis was found but a sigmoid colostomy was performed to divert the fecal stream. The perirectal spaces were opened and a large abscess of the ischiorectal space on the affected side was uncovered.

In consultation with the anatomists it was agreed that the only explanation for this sequence of events was that the obturator membrane had ruptured during the fall. This permitted free access of gas from the ischiorectal fossa to the fascial planes of the leg.

COLLECTIVE REVIEW OF CANCER OF THE COLON AND RECTUM IN A GENERAL HOSPITAL*

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IN 1944 there were 171,171 deaths from cancer in the United States. Twenty-nine thousand of these deaths were due to cancer of the bowel.

It is assumed that the experience at the Allentown General Hospital is representative of the average hospital in the United States. Accordingly, the statistics pertaining to cancer of the colon and rectum during the three-year period from 1947 to 1949, inclusive, were compiled and studied in an effort to clarify some of the problems involved. All cases treated by the various surgeons at the institution during the period of this study were included. The conclusions amply demonstrate both the gravity of the cancer problem and the need for variation of the surgical technic according to the individual requirements of the patient. A method is described for the management of cancer situated in the lower portion of the rectum in certain poor risk patients.

Many of the patients entering the Allentown Hospital for treatment of rectal and colonic malignancies were found to have hopelessly advanced lesions. Adequate follow-up study was possible because these patients were referred from the immediate vicinity of the hospital.

One hundred ninety-seven cases of cancer of the colon and rectum were observed during this three-year period. There were 116 males and eighty-one females, all of the white race. The average age was found to be sixty-three years and the average hospital stay was thirty days. Alarmingly significant is the fact that the average duration of symptoms was found to be twenty-five months.

Pain is recognized as a late symptom of cancer. Significantly, seventy-seven of these patients (38 per cent) indicated pain in the abdomen or rectum as their chief complaint. Thirty-four noted constipation, thirty bleeding, twenty-eight diarrhea, nine presence of a mass, eight loss in weight, eight weakness and three vomiting as their chief complaint.

Obesity is prevalent generally in this community. Although statistical confirmation is lacking in this group of cases, it is believed that many of the patients were considerably overweight.

A review of the distribution of the lesions indicated that six involved the anus, sixty-two the rectum, forty-two the rectosigmoid, twenty-eight the sigmoid, twenty-two the descending colon, four the splenic flexure, seventeen the transverse colon, one the hepatic flexure, three the ascending colon and fourteen the cecum.

Study of the pathologic reports revealed the type of lesion to be adenocarcinoma in 189, squamous cell carcinoma in three and sarcoma in five instances.

One hundred sixty-five patients from the original group of 197 cases were subjected to surgery, either palliative or with hope of cure in one or multiple stages. The subsequent statistical data has been derived from this group of cases. The operability rate has been found to be 83.7 per cent.

Of the 165 patients operated upon, forty had exploration only or simple palliative procedure and 125 had resection, making a resectability rate of 75.7 per cent. Of the resected cases, fifty-eight had Miles' one-stage resection, twenty-seven a multiple stage procedure, thirty-six had resection with primary anastomosis and four had the pull-through type of operation.

Evidence of spread beyond the bowel wall was noted in forty-two patients (36 per cent). This was recorded on the chart as involvement of the liver, glands or contiguous organs.

There were ten operative deaths. Five were attributed to cardiac disease, two to pulmonary embolism, one to peritonitis, one to postoperative shock and one to phlebitis. This constituted an operative mortality rate of 8 per cent.

Thirty-two patients survived over four

* From the Allentown General Hospital, Allentown, Pa.

years. The survival rate of 28 per cent in this group of cases is discouraging. This is believed to be due to delay on the part of the patient in seeking advice. The data previously recorded has established this fact.

It has been difficult to ascertain the exact number of resections performed with the hope of cure. However, it is reasonable to assume that the one-stage Miles operations were performed with anticipation of cure. With this in mind, the cases of those patients undergoing extirpation of the rectum in 1947 were reviewed in an effort to determine the five-year survival rate. Of the eighteen cases, six or 33.3 per cent are living and well today.

It is not pertinent at this time to discuss the various causes for the apparent discouraging data presented. However, it is quite evident that the disastrous delay in diagnosis is due to the patients' hesitation in seeking medical advice.

The number of resections performed in our hospital is constantly increasing and there is a trend toward more radicability. Operability rates have increased; and although sufficient time has not yet elapsed, there is reason to believe that survival rates are constantly improving.

Forty-three per cent of the patients who had rectal extirpations in 1948 were alive and well four years later.

Operative mortality rate has decreased from year to year. In a series of fifty consecutive major proctologic operations performed in 1953 there have been two deaths, making an operative mortality of 4 per cent.

It is probable that at some future time when the data of the resectable potentially curable cases encountered in 1950 to 1952 are evaluated, a five-year survival rate of 50 per cent or better will be found.

It is probably true that the Miles one-stage resection is too radical for certain cancers situated high in the rectum and probably not radical enough for certain cancers in the lower portion of the rectum. It is obvious that a more radical approach to extirpation of lesions in the lower part of the rectum and anus is indicated if there is to be a significantly improvement in the five-year survival rates.

The one-stage combined abdominoperineal resection, preferably according to Bacon's modification, is the first choice in surgical management of low rectal cancers in good risk patients. However, there are a significant number of patients who cannot tolerate this procedure.

The survival rate after resection of lesions in the terminal 6 cm. of the rectum is much poorer than after resection of lesions in the upper half of the rectum, as shown by Waugh and Kirklin who reviewed 388 cases of cancer of the rectum and sigmoid treated by combined abdominoperineal resection. They found that only only 46.2 per cent survived five or more years after operation when the level of the lower edge of the lesion was 0 to 5 cm. above the anal margin. At 6 to 11 cm. the survival rate was 51.1 per cent, and at 11 cm. or more the rate was 53.8 per cent. In all probability this is due to the fact that the pathways of spread are more difficult to eradicate.

The problem of lateral spread has been studied by a number of investigators, including Dukes, Gilchrist and David, Dafoe, Bacon and others. It is likely that their results will indicate that wide extirpation is necessary for cure in this area. It is possible that further research will prove that other factors play a part, but at present this is mere conjecture.

A description of the technic employed at Allentown General Hospital in poor and questionable risk patients having low rectal cancers is indicated. The technic is a modification of the two-stage abdominoperineal resection as described by Dixon. It differs from Dixon's procedure in that the second stage is performed extraperitoneally.

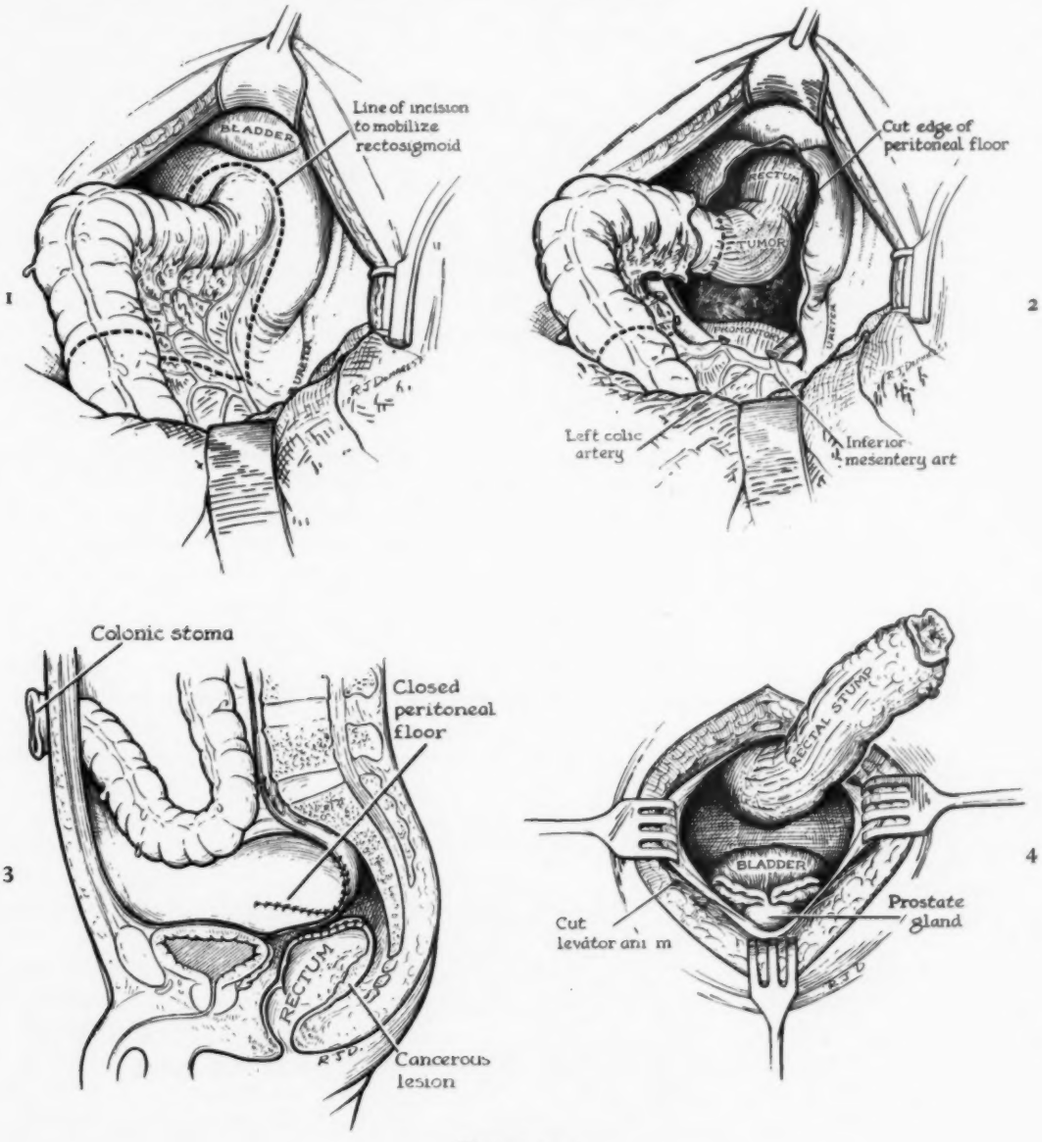
This technic has proved to be reasonably safe and sufficiently radical to compare favorably with all other methods of managing surgical lesions in this location. (Fig. 1.)

The patient is prepared for bowel surgery in the usual fashion. The abdomen is entered, the rectosigmoid mobilized and the inferior mesenteric vessels ligated just below the left colic artery. (Fig. 2.) The rectosigmoid is divided between clamps and a convenient segment of the redundant portion of the distal sigmoid with its mesentery is excised. Then the distal stump is closed with two rows of inverting sutures and allowed to remain below the pelvic peritoneal reflection. (Fig. 3.) Colostomy is established by bringing out the proximal limb of the sigmoid on the abdominal wall. The pelvic peritoneal floor is re-established and the abdomen is closed.

Posterior resection may be accomplished

after an interval of two weeks. (Fig. 4.) This phase of the operation is performed extraperitoneally. The tendency has been to extirpate the tissues widely enough to include a portion of the medial border of each of the gluteal muscles. An elliptic incision is made around the anus, on both sides and the incisions deepened through the medial edges of the gluteal muscles until the origins of the levator ani muscles are encountered. The anococcygeal ligament is cut transversely and the coccyx disarticulated so that the fascia propria of the rectum may be separated from the sacrum and the coccygeus and levator ani muscles transected as close to their origins as possible, together with the investing visceral endopelvic fascia. The attachment of the external sphincter to the bulbocavernosus is cut between clamps.

If the vaginal wall is involved, a section may be excised. The inverted stump of rectosigmoid is removed.



FIGS. 1 to 4.

In male patients the dissection is carried over the bulb of the corpus spongiosum and membranous urethra, and the dissection is continued up between the two layers of Denonvilliers' fascia. If a perforating lesion of the anterior wall of the rectum is found, it is best to remove the capsule of the prostate. It is occasionally necessary to remove part or all of this organ. Dissection is then carried over

the seminal vesicles. If they are involved they are to be excised, but carefully, since the ureters cross the vas deferens above them. The lateral attachments of the rectum should be cut well away from the rectum. The previously inverted stump of rectosigmoid is delivered through the posterior incision. A gauze pack is inserted and the skin partially closed with interrupted sutures.

The operation described has proved comparatively safe and radical and may be adapted to practically all patients having malignant lesions in the lower portion of the rectum. It is to be especially recommended in the poor risk patient.

SUMMARY

A statistical study has been made on 197 cases of cancer of the colon and rectum encountered during the three-year period from 1947 to 1949, inclusive, at the Allentown General Hospital. One hundred sixty-five of these patients were subjected to surgery making an operability rate of 83.7 per cent. Resectability rate was found to be 75.7 per cent. Operative mortality rate was 8 per cent. The over-all survival rate was noted as 28 per cent. However, in a small group of resectable, potentially curable patients operated upon in 1947, the five-year survival rate was 33.3 per cent. The cases in a similar but larger group with operations performed in 1948 showed a four-year survival rate of 43 per cent. It is probable that this increase in survival rate will continue from year to year. The over-all discouraging survival rate is probably due to delay on the part of the patient in seeking medical advice. Data are submitted to substantiate this statement.

A modification of the two-stage abdominoperineal resection as performed on one of the services for certain cancers situated in the lower portion of the rectum at the Allentown Hospital is described.

Acknowledgment: The aid of Miss Helen Micksits of the Tumor Clinic is acknowledged.

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DISCUSSION

Garnet W. Ault (Washington, D. C.): This is an excellent paper, courageously presented and most suitable for an impartial analysis. It specifically illustrates the status of cancer detection in Dr. Kratzer's community and cancer treatment in the Allentown General Hospital. It is probably illustrative of the status of cancer detection and treatment in the average community and hospital in the United States. Reports of this nature should be encouraged by this Society and I sincerely hope that many of our younger members will present similar studies in the future.

One of the most striking statistical facts presented by Dr. Kratzer was that the average duration of symptoms was twenty-five months. This figure, indicative of delay in seeking treatment, should focus our attention on the problem of both lay and professional cancer education. The physicians of this community would do well to explore the reasons for this lack of cancer education among the laity. Their personal efforts should supplement those of the American Cancer Society if the patient delay of twenty-five months is to be shortened.

The statistical evidence that 104 of the 197 cases of cancer involved the rectum and rectosigmoid indicates that over 50 per cent of these patients had lesions accessible for early diagnosis by digital and proctoscopic examination. Might we speculate that many of these patients delayed consultation and indulged in self-medication for diarrhea, constipation or bleeding hemorrhoids? If this is not an erroneous view, is it not the duty of physicians and pharmacists in this community to embark on a lay educational campaign to correct this? Having done so, is it not the duty of physicians, surgeons and proctologists to emphasize that polyp detection is cancer prevention?

The next topics we must scrutinize are the operability rate of 83.7 per cent, the resect-

ability rate of 75.7 per cent, the mortality rate of 8 per cent and the survival rate of 28 per cent. Improvements in these percentages can be anticipated if the patient delay of twenty-five months can be shortened. A survival rate of 28 per cent is indeed discouraging. It is evident that the protologists and surgeons in this community were dealing with advanced carcinoma. I am sure we all share Dr. Kratzer's hopes that the five-year survival for the 1950–1952 series will exceed 50 per cent.

It is evident that Dr. Kratzer hopes to increase the five-year survival rate by utilizing a two-stage procedure. I believe that some of our two-stage procedures can be judiciously extended. Poor risk patients, denied extended one-stage operations, may thus be saved.

The two items that seem most conspicuous in this paper are (1) the patient's delay in seeking medical advice and (2) the low five-year cure rate of 28 per cent. Few will dispute the relationship between patient delay and the low five-year cure rate.

At the risk of being misunderstood, but with charitable intent, it is suggested that greater use and expansion of existing cancer education at a popular laity level be encouraged in this community. It is also entirely probable that a well organized hospital proctology clinic, operated for the benefit of the patient, could be widely publicized. Cancer education, emphasizing the value of digital and proctoscopic examinations as a means of detecting precancerous, asymptomatic, adenomatous polyps and early carcinoma should be encouraged.

This paper appears to be quite representative of the basic problems involved in cancer detection and treatment. Dr. Kratzer is not alone in facing these problems and his paper merits discussion by others.

L. E. Brown (Berkeley, Calif.): Dr. Kratzer's paper is quite timely. My attention particularly is attracted to his statement that hospital records show that patients delay two years in seeking medical advice after rectal symptoms appear. It is entirely possible that the hospital records may indicate this long delay, but it is difficult to believe that most of these patients had not sought medical advice previously. As we all know, hospital histories are too frequently short and inadequate. Furthermore, many patients certainly refrain, either intentionally or otherwise, from telling the attending physician that they have been to other doctors for these symptoms. A careful and searching history will usually reveal this fact. It is more likely that the previous attending physician failed to appreciate the significance of the patient's complaints or made inadequate examinations, or neglected to insist on follow-up observations.

It is my opinion that we, as doctors, in general are in some part responsible for this two-year lapse of time from the appearance of symptoms and the final diagnosis and treatment of cancer of the rectum. With the present publicity given to the significance of rectal bleeding and the patients' present alertness, they certainly come to the physician at an earlier time than previously, and we ourselves must also be more alert to the possibility of malignancy of the rectum and colon. Let us not place the entire blame on the patient.

Roy A. Cummings (Los Angeles, Calif.): In the foregoing essay proper emphasis was placed upon the importance of early diagnosis of bowel malignancy. Despite this oft-repeated bit of wisdom it is all too evident that many cases are escaping early detection at the hands of the physician who first sees the patient. Frequently bleeding continues after he has performed some surgical procedure upon the anal canal. At a belated sigmoidoscopy, after a waste of valuable time, carcinoma occasionally is seen just beyond the reach of the examining finger. Delay has jeopardized the chances for a cure. In the last few months two such cases were referred to my office. Several years ago I diagnosed adenocarcinoma in a man who had spent the previous six months under medical observation in a government hospital. Surprisingly, in all this time no one had even asked him if he had passed blood from the bowel.

An important function of the general hospital is the training of physicians. Only a small portion of the resident staff will ever become specialists. Every effort must be made to implant in the minds of all the utmost importance of early examination of the easily accessible portion of the lower bowel, where the large percentage of malignancy occurs. The staff rules of every hospital should make a sigmoidoscopic examination, with a record of these findings, a prerequisite to any operation upon the anal canal.

David C. Ditmore (Boston, Mass.): Dr. Kratzer has shown us some beautiful x-ray plates demonstrating improved technics for

showing bowel disease, and illustrating how useful and necessary the x-ray can be in establishing the diagnosis of obscure ailments. I am disturbed because some responsible and influential sources are initiating policies which tend to discourage this type of x-ray as a diagnostic procedure, except in cases in which the presence of cancer is practically certain. I refer to a recent decision of the Blue Shield of the Massachusetts Medical Service. Their contract agrees to pay for x-rays which are related to surgery which has been or is to be performed, and until recently they have honored that contract. Now, however, they have usurped the privilege of interpreting to their own advantage the concept of the relation of x-ray to the surgery. They question their responsibility to pay for x-rays taken for the purpose of establishing a definitive diagnosis in anorectal disease unless cancer is found, and are refusing to pay for x-rays taken after any surgery is performed. To justify their action they claim x-rays taken subsequent to operation are for the purpose of discovering new disease. To strengthen their ruling further, they cite the fact that when x-rays are taken in cases of suspected cancer and none is found, no surgery results and they do not pay for the x-rays. This argument is entirely without basis since the study is made to establish a definitive diagnosis and this cannot be done without a negative x-ray.

Numerous cases which serve to illustrate the importance of both pre- and postoperative x-ray studies in anorectal disease may be cited by any proctologist. For instance, there is the patient who complains of having had bleeding, protruding hemorrhoids for three months. Questioning elicits the information that there has been a change in bowel habit. Up to three or four months before, he had had an evacuation every day, but since that time he has been constipated and has had diarrhea following a laxative. The patient complains that the movements are more frequent and explosive in type and are accompanied by much gas, moisture, blood and fecal debris. Other characteristic symptoms are present and the surgeon's responsibility is clear. With direct inspection, digital examination, sigmoidoscopic or x-ray studies should be carried out. The responsibility of the Blue Shield to pay for that x-ray, in my opinion cannot be righteously questioned.

On the other hand, there are cases not so obvious. For example there is the patient utterly demoralized because of an agonizing and constantly painful anus. She cannot give a history without crying; there has been an occasional streak of blood on the toilet paper and because of pain she avoids bowel movement unless the stool has been softened by a laxative. She has, however, been constipated all of her life so this is not particularly significant. Digital examination is out of the question because of the patient's distress when it is attempted. Only the enthusiastic, newly graduated doctor insists upon digital, sigmoidoscopic or x-ray study with its necessary bowel cleansing before operation. The kind and compassionate attending surgeon will put the patient in the hospital and under anesthesia take care of the perfectly evident infected anal fissure, which is visible the moment the buttocks are spread. That surgeon will realize, however, he has operated upon a presumptive diagnosis and that his obligation to save his patient's life has not yet been carried out. He will hasten to proceed with the necessary examinations, which would definitely include x-ray studies of the colon. The mere fact that this is done after the operation in no way alters its relation to the surgery performed. If he does not do this, he will hear later of some of his patients who have been operated upon for cancer or have lost their lives in such a short time after being in his care as to leave no doubt that his neglect is responsible for the unfortunate outcome.

I am accused of being too altruistic when I espouse the rights of the policyholder in these cases, but be assured this is not true. The psychologic effect on the patient, whom we have persuaded to have the examination, is very important. He asks himself who is right, the doctor or the insurance company. In some cases he will answer the question in favor of the company, forgetting entirely that the doctor is interested only in his patient's welfare and does not profit. It is of interest to speculate as to the widespread results of this policy. Will not other companies adopt the practice of likewise making their own decision as to why examinations are carried out, in total disregard of the surgeon who has ordered the studies? Must we always take into consideration the willingness of the insurance companies to pay for indicated studies? Is not this the beginning of regimentation? Are the insurance companies

or the surgeon to dictate the steps to be taken in the care of the patient? Do they propose to enforce their preferences through the power of the purse or through the science of medicine? It seems to me the answer to these questions is a simple yes. Those of you who think the matter of sufficient importance and who agree with me should write to the Secretary of the American Proctologic Society, giving your views and suggestions. No one individual can carry the torch. Our Secretary can convey your ideas to the proper authorities in the Blue Shield. The collective views of the entire Society if properly expressed might carry some weight.

C. A. V. Burt (New York, N. Y.): I would like to call attention to those rather infrequent patients who present real problems. These patients continue to have symptoms of blood and mucus in the stool, and perhaps abdominal cramps and loss of weight, even though three or four barium enemas have been reported negative and several sigmoidoscopies have failed to reveal the cause of symptoms suggestive of carcinoma.

We can, as a differential procedure, inject the hemorrhoids. This will usually stop bleeding from the hemorrhoids and help us to differentiate, but we have to persist further and be absolutely certain of our diagnosis even though we have to perform a laparotomy.

Each year we all probably see several of these patients in whom no diagnosis can be made except by operation. I recently had two of them. One had been followed up by a surgeon for approximately nine months without a diagnosis being made. She had carcinoma of the sigmoid. We must persist in the repetition of our barium enemas and sigmoidoscopy under anesthesia if necessary.

By bimanual sigmoidoscopy I was able to press the tumor down into the sigmoidoscope in a few cases. It is a very serious problem because of the overlapping loops of the sigmoid covering up the filling defect, so that we cannot readily determine the diagnosis. In those instances we must operate upon the patients if we cannot make our diagnosis otherwise.

Guy L. Kratzer (closing): I should like to re-emphasize one point. Regardless of the causes, in the majority of cases when these patients came to the hospital, they were beyond surgical help. I think that accounts for the low survival rate.

AN ANALYSIS OF CAUSES OF MORBIDITY AND MORTALITY IN COLONIC SURGERY

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IN 1776 the Continental Congress launched a nation upon a new political course, and a man by the name of Pillare, in Rouen, set the surgeons of the world upon the path of colon surgery. We have been busy ever since trying to improve the results of the trends which they initiated. In both cases much progress has been the result of avoiding repetition of errors. Analysis of past performance is the ideal way to mark errors for future omission.

TABLE I
BREAKDOWN OF 100 CONSECUTIVE COLON OPERATIONS

	No.
1. Combined abdomino-perineal resections	
(a) Miles	27
(b) Bacon	2
(c) Hartman	2
(d) Lockhart-Mummery	2
	33
2. Resection and primary anastomosis without decompression	19
3. Resection and primary anastomosis with prior or complementary colostomy	10
4. Mikulicz resection	2
5. Colotomy and polypectomy	6
6. Colostomy or cecostomy in advance of resection	11
7. Colostomy, palliative	7
8. Closure of colostomy	6
9. Ileostomy	4
10. Ileostomy and subtotal colectomy	2
Total	100

The following is an analysis of complications in patients undergoing surgery of the colon for tumor, ulcerative disease, or trauma, and is made of the author's last 100 consecutive cases. Table I shows a breakdown of the cases into surgical procedures. The fatal and the five most common non-fatal complications are discussed in their relationship to the surgical procedure, the disorder being treated and the general medical status of the patient. Mention is made of the treatment used for each type of complication discussed.

Table II shows the relationship of complications to surgical procedures by name and number of instances.

In this series of 100 surgical procedures complications causing death developed in five cases. These complications all appeared in the cardiovascular system. They consisted of two cases of cerebral hemorrhage and one each of pulmonary embolism, ruptured esophageal varices and cardiac arrest.

The patient dying of pulmonary embolism did so twenty-three days after a right hemicolectomy with ileocolostomy and with tube decompression of the stump of the transverse colon and anterior resection of the rectosigmoid with primary anastomosis, for coexisting carcinoma of the cecum and rectosigmoid. This patient had been bedfast for nearly a year prior to surgery because of anemia and arthritis. Of the two patients dying of cerebral hemorrhage, one developed her complications six days after a palliative colostomy, done only after extensive dissection of pelvic adhesions and mobilization of the rectosigmoid permitted me to find direct tumor invasion of the sacrum. The second case of cerebral hemorrhage, as well as the case of ruptured esophageal varices and the case of cardiac arrest were in elderly arteriosclerotics known to be less than good risks by reason of myocardial degeneration, chronic kidney disease and chronic alcoholism who were subjected to Miles resections.

The lesson suggested is this: In four of the five mortalities more careful preoperative evaluation might have led to more conservative surgery—a Lockhart-Mummery resection instead of a Miles, a loop sigmoidostomy without pelvic dissection in the non-resectable case, and a two-stage procedure in the double carcinoma.

A sixth mortality occurred not as a complication but as the result of progression of the original disease in a patient desperately ill with ulcerative colitis with localized peritonitis, for which an ileostomy was done. This is an example of failing to refuse belated responsibility for a moribund patient.

Of the non-fatal complications, the most common and the most troublesome was small bowel obstruction. There were eleven such

cases in this series. None required re-operation, all responded to varying periods of intubation which was accomplished with the Harris tube sometimes with considerable effort. The incidence of this complication was highest in the abdominoperineal resections, being about three

colon as it ascends to the abdominal wall. The first two of these sources of small bowel adherence and angulation are necessarily present after a Miles resection. While extremely careful ligature of the mesocolic vessels and meticulous peritoneal closure of all cut edges and defects

TABLE II
COMPLICATIONS BY OPERATIVE PROCEDURE

Complications	Procedure										
	A.P. Resection	Mikulicz	Resection and Anastomosis	Resection and Anastomosis, Colostomy	Ileostomy	Ileostomy, Subtotal Colectomy	Colotomy, Polypectomy	Colostomy, Palliative	Colostomy, Pre-resection	Closure of Colostomy	Total
Small bowel obstruction	7	..	2	..	..	1	..	1	..	..	11
Bladder retention	6	..	..	1	..	..	..	..	..	..	7
Pyelitis without retention	2	..	..	..	..	..	..	..	..	..	2
Cellulitis, incisional	3	1	2	1	1	..	..	1	1	..	10
Pelvic abscess	2	..	..	..	..	..	..	..	..	..	2
Peritonitis	..	..	..	..	..	..	..	..	1	..	1
Hemorrhage	..	..	1	..	..	..	..	..	..	..	1
Evisceration	1	..	..	..	..	..	..	..	..	..	1
Ileostomy syndrome	..	..	..	..	2	1	..	..	..	..	3
Stenosis of colostomy	2	..	..	..	..	..	..	..	..	..	2
Anuria	..	..	..	..	..	..	..	1	..	..	1
Pulmonary embolism	..	..	..	1*	..	..	..	..	..	..	1*
Thrombophlebitis	..	..	..	1	..	..	1	..	..	..	2
Cerebral hemorrhage	1*	..	..	..	..	..	..	1–1*	..	..	1–2*
Cardiac arrest	1*	..	..	..	..	..	..	..	..	..	1*
Ruptured esophageal varices	1*	..	..	..	..	..	..	..	..	..	1*
Atelectasis	1	..	..	..	..	..	..	..	..	..	1
Fecal fistula	..	..	4	..	..	..	..	..	..	..	4
Skin excoriation	..	..	..	..	1	..	..	..	1	..	2
Jaundice	..	..	1	..	..	..	..	..	..	..	1
Hyperthyroidism	1	..	..	..	..	..	..	..	..	..	1
Psychosis	1	..	..	..	..	..	..	..	..	..	1
Neuritis, traumatic	..	..	1	..	..	..	..	..	..	..	1
Non-fatal	26	1	11	3	4	2	1	4	3	0	55
Fatal	3	..	..	1	..	..	..	1	..	..	5

* Fatalities.

times as frequent as in resections with anastomosis. Since handling of the small bowel in the course of anterior resection and anastomosis is appreciably greater than in abdominoperineal resections, direct trauma does not appear to be a factor in the disparity of the incidences. This leaves three possible sources of small bowel obstruction to account for the difference. The first is the cut edge of the mesocolon. The second is the suture line in the new pelvic peritoneal floor. The third is the aperture between the left paracolic gutter and the terminal

will have a good effect, the potential for trouble is inherent in the procedure. The third site of possible small bowel obstruction, the aperture between the left wall of the abdomen and the terminal colon, was in these cases not closed, since it is my habit to bring the colostomy through the incision just a short distance from the left inferior aspect of the umbilicus. It may be that less difficulty with the problem would follow a more lateral colostomy with closure of the peritoneal gutter on the left. However, the absence of obstruction in the cases in which

a loop colostomy was used without such closure raises some question as to the value of substituting a suture line for a large aperture at this site. This is an interesting parallel, on a very small scale, to a group of thirty-seven obstructions seen at laporotomy or autopsy following over 1,000 cases of combined resection reviewed by Goligher and others.[1] A certain number of them represent the hazards of any abdominal operation while the majority represent hazards peculiar to the combined operation.

The next most common complication seen in this series was cellulitis of the abdominal incision. It developed in ten cases and was proportionately distributed among all the procedures with exceptions of colotomies with polypectomy and closure of colostomy. Of the ten cases of wound infection, five presented problems that wet dressings and spreading of a small portion of the incision did not solve. One of these was a complete wound dehiscence with evisceration on the fourteenth postoperative day following a Bacon-type resection in a patient who had suffered intermittently with small bowel obstruction and hiccoughs from his fifth postoperative day. Treatment consisted of continued intestinal intubation and prompt through-and-through single layer closure. The second case was one of abscess formation in the fascial planes adjacent to a loop sigmoidostomy for traumatic perforation of the rectosigmoid with diffuse peritonitis. This responded to incision and drainage. Three cases of skin separation were closed secondarily after a period of wet dressings.

Prevention of this complication is more important than its treatment. Inadequate preparation played a possible role in three cases which could not be prepared in the usual manner. The remaining seven cases, including the dehiscence, had all been prepared with accepted dosages of the sulfonamides with the addition, in the anastomosis cases, of streptomycin or terramycin for forty-eight hours. Furthermore, all had penicillin and streptomycin for the first five postoperative days, excepting the patient with peritonitis who received terramycin intravenously. All but one case had a subcutaneous Penrose drain in place for three to six days postoperatively. It becomes apparent that sulfonamides and antibiotics are small compensation for technical error. In considering the combined resections, the lesson suggested appears to stress careful covering of the transected colon, avoidance of spillage from the colostomy if immediate tube decompression is done, and a change of gloves and instruments when there is any suspicion of leakage during the pelvic freeing of the rectum. Of the resections and anastomoses, all were done by the open method. It seems that unless improved technic can lower this incidence of incisional infection, a comparison of the incidence in a larger series of open anastomoses with that in a series of closed anastomoses is mandatory. Thereafter a trial of the closed method should be made if indicated. Although a comparative series reported by Rosemond and others[4] showed a higher incidence of peritonitis following the closed rather than the open method and another comparative series by Kittle[2] and others led them to conclude that the open method results in as low a morbidity and mortality as does the closed, neither paper mentions the incidence of wound infection.

Bladder retention was the complication third in frequency in this series. Such retention was encountered seven times, six cases being among the thirty-three abdominoperineal resections. Of these six, four responded to a further short period of catheterization, bladder irrigation and appropriate medication for the accompanying pyuria. The other two were difficult problems. Both had previously had urologic surgery. Bladder retention represents, so to speak, a weakness of the abdominoperineal resection. How one is to overcome the effects of destruction of innervation, loss of support and fixation of the post-trigonal depression of the bladder and still fulfill the requirements of the procedure is a problem for which I have no solution. Williams and others[6] have suggested the value of preoperative transurethral resections in cases in which prostatic hypertrophy exists. It appears to me that this is a reversal of the more logical application of transurethral resection postoperatively in those who require it.

Fecal fistula was the complication fourth in frequency and there were four instances in the series. All occurred in patients subjected to resection with primary open end-to-end anastomosis without prior or complementary colostomy. The most obvious cause, insecure anastomosis, does not fit the picture since none of the patients developed clinical peritonitis and since none showed fecal drainage before the

sixth postoperative day. This is a valid conclusion particularly since each case had Penrose drains placed at the anastomotic site at operation and there was no obstruction to delay the appearance of intestinal content. Indeed these drains may have contributed to the development of the fistula, if one subscribes to the theory that siphoning off the serum from an anastomosis interferes with the laying down of a very useful plastic exudate at that point. In 1930 Polya[3] speaking of drainage of colon anastomoses stated that "perhaps to a great extent it may be responsible for its (the 'anastomosis') insufficiency. On the other hand it mitigates against its (the 'anastomosis') very danger and renders the operative procedure safe." Since, however, there were an additional six drained anastomoses among the resections which did not develop fistulas, other factors must be considered. The first is absence of proximal decompression in these four cases; the second is the possibility of compromise of the blood supply after the anastomosis when the mesenteric defect is sutured; and the third is tension on the suture line. Any or all of these may operate to produce delayed leakage of an originally well sutured anastomosis. Since this complication is not an inevitable sequel to the procedure, its appearance indicates an error in technic and its elimination should be possible. Three of these fistulas closed within three weeks and the fourth within four months. The treatment was largely expectant.

The condition called the "ileostomy syndrome" by Warren and McKittrick[5] complicated three of the six cases subjected to ileostomy with or without subtotal colectomy. In two instances intubation of the terminal ileum intermittently over a period of six to ten days relieved the colic. The third case proved refractory to this treatment but was relieved by minor revision of the ileostomy, although stenosis was not marked and was no greater than in other cases without this syndrome. Since each of the involved ileostomies was constructed in a different manner, each variation being a deliberate attempt to avoid the very complication which ensued, technical error cannot be named the cause. The theory has been advanced that fixation of the ileum to the abdominal wall interferes with the neuromuscular coordination of the gut and sets up a type of functional obstruction. However, I believe it is accurate to state that the cause of ileostomy syndrome is not known, and at this time it may be considered a potential complication inherent to the establishment of an ileostomy.

SUMMARY AND CONCLUSIONS

The complications appearing in 100 consecutive operative procedures on the colon or terminal ileum are analyzed.

All of the complications are classified and tabulated.

Many of the complications are discussed with the intent to identify their causes.

No conclusions are drawn.

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DISCUSSION

Ralph M. Burke (Detroit, Mich.): This paper by Dr. McAdams represents a frank and critical analysis of his material. Some of the more frequently occurring complications presented in this series of cases will be briefly discussed.

Small bowel obstruction was listed as occurring eleven times in the series, and all of these cases responded to intubation with the Harris tube. This question was discussed in the paper purely from the standpoint of mechanical causes. The fact that all of these patients without exception responded to intubation would cause one to suspect that adynamic ileus should be given major consideration as to etiology here. Most cases of mechanical obstruction require operative intervention and it is those early cases, in which associated edema is a factor, which can be expected to

respond to intubation. Failure of prompt re-establishment of patency of the lumen of the bowel, as shown by the passage of gas, is an indication for surgery. Serial x-ray studies are of great value in this regard. The introduction of air by the use of enemas may be misleading unless kept in mind in the interpretation of the x-ray films. The use of a long tube in mechanical obstruction requires constant re-evaluation of the status of the obstruction and considerable experience on the part of the operator to avoid the pitfalls which are inherent to its use.

I have seen adynamic ileus much less frequently in the past several years. The simple expedient of withholding everything by mouth until active peristalsis is heard has made postoperative distention a rather rare occurrence. It has been my experience that the preoperative intubation in elective colon surgery does not add enough value to offset the discomfort it causes some patients, and I now avoid it whenever possible.

Cellulitis showed an incidence of 10 per cent in this series. Aseptic anastomosis might conceivably lessen this incidence as suggested by the author, but it would not be worth sacrificing the advantages of an open anastomosis for this possible benefit. It would seem that aseptic anastomosis has its greatest sphere of usefulness when adequate preoperative preparation of the colon has not been possible. Minimizing contamination by thorough preoperative preparation and isolation of the operative field is materially aided by flushing the wound with saline after peritoneal or fascial closure has been completed. One cause of wound maceration and subsequent infection is the common use of vaseline on the skin surface when the bowel is exteriorized. Lahey has pointed out that dry gauze is the best support of an exteriorized limb, and the objection that dry gauze is difficult to remove is not borne out in practice. Vaseline gauze may be used external to the dry gauze—away from the skin surface—for purposes of early periodic inspection of the exteriorized bowel without encountering this objection.

Fecal fistula occurred in 20 per cent of nineteen anterior resections *without* proximal decompression, each of these having drains placed to the site of anastomosis. Ten such cases *with* proximal decompression showed no incidence of fistula, but how many of these had drains to the anastomotic site was not given by the author. While it is conceivable that the use of drains may increase the risk of fecal fistula, it is a common observation that they do increase the incidence of lieus. Drains are of little value in a secure anastomosis and are not adequate alone in an insecure one. Tension at the suture line is frequently given less consideration than are adequate circulation and technical execution.

Regarding the etiology of ileostomy dysfunction, the suggestion of Turnbull that this is due to edema of the presenting limb seems sound and is borne out by the shaggy appearance of the mucosa on x-ray. The usual prompt response of these cases to intubation of the stoma and suction seems to bear this out. The small bowel is not very tolerant of exteriorization.

VILLOUS TUMORS OF THE RECTUM BELOW THE PERITONEAL REFLECTION*

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VILLOUS tumors are also referred to by such terms as papillomas, villous papilloma, papillary polyps or adenoma, columnar or mucous papilloma and occasionally villoma.[1]

Historical Background and Occurrence. This variety of tumor is considered rare, being the most infrequent of the so-called benign tumors of the rectum. Mathews[2] in 1897 wrote: "I believe a villous tumor to be the rarest of all rectal affections. In my experience of fifteen years devoted to rectal practice, I have seen but one case." At that time he reviewed the American and English medical literature and could find only twenty-three cases recorded. T. C. Hill[3] in 1910 recorded reports of sixty-four cases and thirty-seven of these were by English authors. In that same year over 42,000 admissions, with rectal ailments, were reviewed from St. Marks Hospital, London, and twenty-five villous tumors were recorded. In 1934 Bowman[9] reviewed 1,000 patients seen in Proctologic Clinic of Hamilton, Ontario General Hospital and could find but one villous papilloma. He further states that less than 100 tumors of this type were reported in the literature at that time. In 1952 Swinton and Doane[4] of the Lahey Clinic reviewed 300 patients with benign polyps of the colon and rectum and recorded twenty as having had papillary adenomas, or an incidence of 6.6 per cent. It is difficult to arrive at any conclusion as to the relative frequency of these growths by studying reported cases or hospital records and to transpose into percentage of occurrence in relation to benign rectal tumors.

Age Distribution. This tumor occurs almost exclusively in adults. Age tabulated in seventeen cases studied varied from forty to eighty with an average of fifty-six years. In 1936 Preusser[8] reported a detailed analysis of fifty-nine cases gleaned from the literature. The age incidence was as follows: before forty, three; 40 to 50, fifteen; 50 to 60, thirteen; 60 to 70, seventeen; after 70, eleven. In our eleven cases the average was higher, being approximately sixty-five years. The sex distribution is about the same. They occur singly. No cases were found in which more than one segment of the bowel was involved at the same time. There is no indication of familial tendency.

Pathology. This delicate structure arises from the mucosal epithelium and is restricted to the mucous membrane level unless malignant degenerative changes have taken place. These tumors tend to grow by progressive lateral spread. Basically the main difference between villous tumor and adenoma is that a papilloma is a primary tumor of mucosal surface with secondary glandular change, while adenoma is primarily a tumor of the submucosal glands with little or no involvement of the surface epithelium. Grossly the villous tumor consists of a large number of friable, finger-like projections which are joined at the base. It is usually grayish-red in color and quite vascular. They vary in size from nodular masses to large obstructing lesions. In almost all cases these growths are sessile in attachment; and when they become pedunculated, it is from weight pulling down on redundant mucosa. Microscopically, the tumor consists of numerous villi with supporting connective tissue which is quite vascular. Some of the vessels reach almost placental proportions. Columnar epithelium covers the surface.

Symptoms. The most frequent complaints in order of frequency are excessive production of mucus, resulting in frequent sticky, mucoid, thin stools. Tenesmus is present especially in low-lying tumors. Bleeding, in varying degrees, is present in most cases. If the mass is large and associated with moderate redundancy, protrusion of the tumor through the anal orifice occurs with straining. Symptoms of partial obstruction may be present.

Diagnosis. If the mass can be reached on digital examination, and it usually can, it has a

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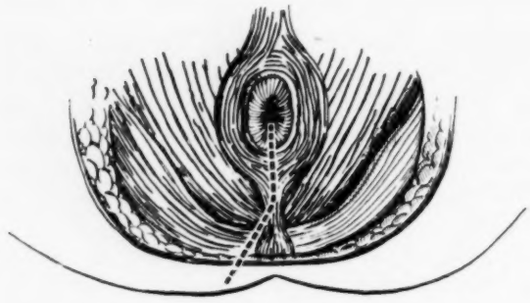
soft, velvety feel. Most often it is of large size and sessile. It is friable, bleeds easily and close inspection of the index finger after digital examination may reveal fragments of tumor adhered. These fragments will float if placed in water. The finger in all cases may be inserted into the mass between the villi. The tumor lacks the solid structure of adenoma and the induration of base and margin as in carcinoma. On proctoscopic examination considerable viscid mucus is encountered. When suction is applied to the tumor, fragments adhere to the openings on the tube end and secondary active bleeding is frequent. Usually the tumor mass fills the end of the instrument.



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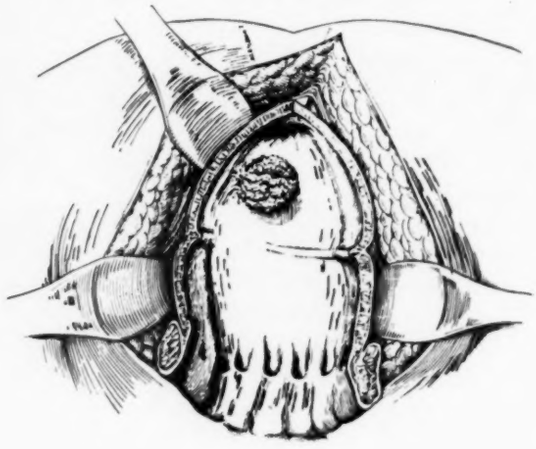

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FIG. 1. Drawing showing incision route through posterior rectum; lateral to coccyx.

FIG. 2. Drawing of exposed villous tumor in mid-rectum following exposure by Bevan approach. (Figs. 1 and 2 were obtained from the Medical Art Department, University of Louisville School of Medicine.)

Because of the tendency of a villous tumor to undergo malignant degeneration in from 20 per cent upward of cases,[5,6] multiple biopsies are indicated. The biopsy bite should include primarily the submucous and even muscularis tissue rather than glandular element alone.

Treatment. Gabriel[7] states "these tumors can only be effectively treated by surgical excision." X-ray and radium have no place in their treatment. Surgical extirpation for low and mid-rectal lesions, proven non-malignant, may be accomplished by one of two methods depending on circumstances. First, if the tumor is of small to moderate size and adequate mucosal redundancy is present, it can be pulled to the outside. The mucosal pedicle then can be transfixed and firmly ligated, the surgeon being sure to leave adequate mucosa distal to the ligature to prevent slipping. Second, a Bevan's procedure can be utilized. All layers of the sphincter musculature are divided by a posterior incision which may be carried upward to include the levator muscle if necessary. Retractors are then put in place to expose the rectal ampulla. Using gauze retraction, the tumor is elevated. The base is ligated in stages and either interrupted Goodsall's stitches are put in place or the mucosal defect can be closed by using fine interrupted catgut in several layers. (Figs. 1 and 2.)

Actual cautery, electrofulguration, desiccation and electrolysis are seldom to be recommended. We believe that under certain very extenuating circumstances the use of these is justifiable as a means of palliation. They are not, however, recommended. We are including one case in our report which we believe will illustrate this point. It *is most* difficult to destroy all of the glandular tissue by diathermy. Fulguration may be utilized to advantage in destroying any small outlying recurrence following primary removal.

CASE REPORTS

CASE 1. Mrs. M. S., age eighty, illustrates a case in which the villous tumor was an incidental finding on hospitalization, this patient being admitted to Kentucky Baptist Hospital in July, 1951, as a house case with a diagnosis of cardiac hypertension, bundle branch block and pulmonary infarction. During her stay it was found she passed blood-stained, mucous stools. The patient's history was unreliable. On

routine rectal examination the resident found a suspicious lesion and asked us to see her in consultation. The findings were those characteristic of a villous tumor, the mass being located at 6 to 8 cm. level in right posterior rectal area. The tumor was approximately the size of a ping-pong ball and attached by a broad base. Proctoscopic examination to the 24 cm. level was negative for any other lesion. Barium enema and x-ray study revealed the presence of numerous diverticula of the sigmoid colon but was otherwise negative. Biopsy was taken and confirmed the clinical diagnosis of villous tumor. This patient was not receptive to the idea of surgery. No follow-up was done after she was discharged from the hospital.

Case II. Mrs. O. L. O., age eighty-two, was seen in Queens Daughter Hospital, Shelbyville, Kentucky, October, 1951. Her villous tumor had been found approximately three months prior when she was hospitalized with a broken hip. During her convalescence she complained of rectal pressure, bleeding and passage of loose stools. Biopsies were done at that time and confirmed the clinical diagnosis. There was no evidence of malignant disease and sigmoidoscopic examination was otherwise negative. The growth was approximately 3 cm. in diameter and attached at 7 to 9 cm. level above the pectinate line. It had a broad base and considerable redundant mucosa. Under low spinal anesthesia, with the patient in the prone position, we were able to deliver the mass down to the anal orifice but it could not be brough to the outside. The mass was removed and the wide pedicle was transfixed. Recovery was uneventful and the patient was discharged in five days. When last heard from in December, 1952, the patient at eighty-three was enjoying good health and was free from any recurrence.

Case III. Mr. S. S., age sixty-five, was first seen in the home with a prolapsed villous tumor which he thought was the piles. He was a severe cardiac, had marked arteriosclerosis and paralysis agitans. His medical attendant desired that the least possible be done to relieve him of his symptoms of tenesmus, prolapse and blood loss. He was hospitalized in December, 1950, at the Jewish Hospital. Under sacrocaudal block anesthesia, using a loop curette, a large, wide, villous tumor covering approximately 4 sq. cm. area of the rectum on the left posterior wall at the 6 to 10 cm. level was removed. The base was fulgurated. The pathologic report was villous tumor with characteristic tissue pattern. This patient remained in the hospital three days. He remained free from all rectal symptoms until the time of his cardiac death approximately four months later.

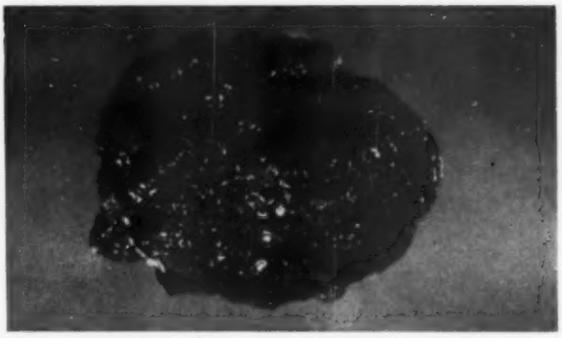

Fig. 3. Case VI. Photograph of specimen of villous tumor removed by Bevan procedure.

Case IV. Another patient, Mrs. M. L., age seventy-two, who was seen in October, 1951, was treated in a similar manner to that used in Case III. She had medical conditions which were contraindicative to surgery. The tumor in her case was in the upper one-third of the rectum. She has had monthly check-ups and extensive repeated fulgurations in the office during the past fourteen months. Five recheck biopsy specimens have been studied from the base with no evidence of malignant disease as of December, 1952.

Cases V and VI. A Bevan's procedure was employed on two patients, one of which is recorded. The first patient, Miss F. R., age forty-six, was operated upon in October, 1950, at St. Anthony Hospital, and the second patient, Mrs. J. S., age sixty-five, was operated upon in July, 1950, at St. Joseph Infirmary. She was first seen in June, 1950, with history of bloody diarrhea for the two years previously. At that time a large villous tumor was found on the anterior wall of the rectum extending from 5 to 8 cm. level and approximately one-third of the diameter was involved. Multiple bite biopsy specimens were confirmatory with no malignant changes present. On July 10, 1950, the patient was admitted to the hospital and was given a blood transfusion prior to surgery, the red blood count on admission being 3.2. Other laboratory tests and barium enema examination with air contrast were normal. The patient was operated upon July 14th under pentothal and sacrocaudal anesthesia in the prone position, utilizing the Bevan approach for exposure of the rectal ampulla.

(Fig. 3.) The tumor was removed and primary closure was completed. The postoperative course was uneventful and she was discharged on the fourteenth hospital day. She was followed for thirteen months; and when last seen, there was no evidence of local recurrence and the patient had satisfactory sphincter control.

CONCLUSION

1. Villous tumors are relatively rare but interesting entities.

2. Historical background, occurrence, distribution, pathology, signs and symptoms have been reviewed.

3. Six cases of villous tumor of the rectum were reviewed illustrating four different methods by which the non-malignant tumors were handled.

4. Therapy in each case required individual consideration.

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VILLOUS TUMORS OF THE RECTUM AND SIGMOID COLON ABOVE THE PERITONEAL REFLECTION*

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VILLOUS tumor, more properly called villous papilloma of the rectum, has been classified among the more rare[1] tumors of that portion of the anatomy.

We were unable to find any discussion of this interesting entity in the Transactions of the American Proctologic Society since 1924. In 1910 Hill[2] presented a paper on this subject. In 1922 Adams[3] of Philadelphia reported the case of a forty-seven year old man, and in 1924 Dunne[4] reported the case of a fifty-three year old man.

Hill in his paper referred to Ricketts' case, presented before this Society in 1907. He stated that at that time but "sixty-two cases have been reported, nine of which have been by six American authors. It is rather difficult to arrive at any conclusion as to the relative frequency of these growths by studying the reported cases . . . as these borderline tumors are generally very loosely classified." Hill[1] further stated: "The chief point of interest about these tumors is that a certain percentage of them show a marked tendency to undergo malignant degeneration."

We have encountered eleven cases of villous papilloma. Of these, five cases occurred at or extended to levels above the peritoneal reflection. This paper will discuss the latter cases.

Villous papilloma apparently almost never occurs before the age of forty years and then becomes more frequent with increasing age. It so happens that our patients are predominantly females but we do not believe that sex plays any important part in the incidence.

Symptoms. All reports are in remarkable agreement as to the principal presenting symptoms reported by the patients. They can be no better tabulated than has been done by Bacon[5] who stated, "The symptoms of the villous tumor may be enumerated as follows: (1) frequent passage of excessive rice-watery or sticky mucus, usually tinged with blood; (2) hemorrhage due to friability of the surface; (3) incomplete evacuations; and (4) pain (discomfort), usually in the form of tenesmus." We would like to add two corollary complaints,

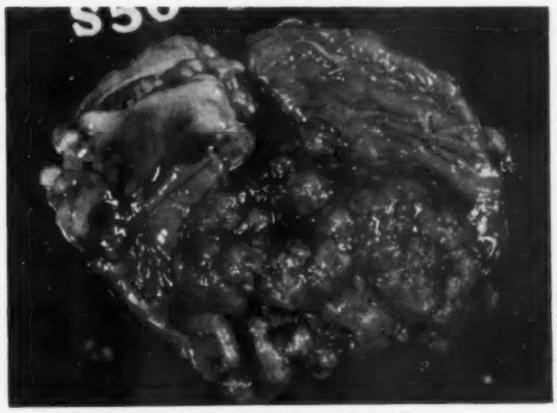

FIG. 1. Gross specimen of resected villous tumor of sigmoid.

namely, low grade secondary anemia and marked chronicity. These people usually present themselves because they have grown tired of their nagging symptoms; our histories of duration range from six months to nearly six years.

Physical Examination. This is one tumor which is nearly always quite accessible to the proctoscope and usually may be reached with the index finger. Many times it is prolapsed to the outside by the patient. Digital and proctoscopic examination reveals a slippery growth bathed in sticky mucus. It[6] is so soft to touch that one may almost doubt that he is feeling a tumor mass. Proctoscopy shows the mass to be soft, lobulated and pinkish in color. It is very friable and pieces are easily removed by the suction tip while aspirating the mucus. It bleeds easily and freely but only rarely is there real hemorrhage. Very frequently the growths are multiple, often showing a large mass and several delicate small satellites.

Pathology. This delicate structure arises directly from the mucosa. It usually consists of a large number of villi which are joined at their

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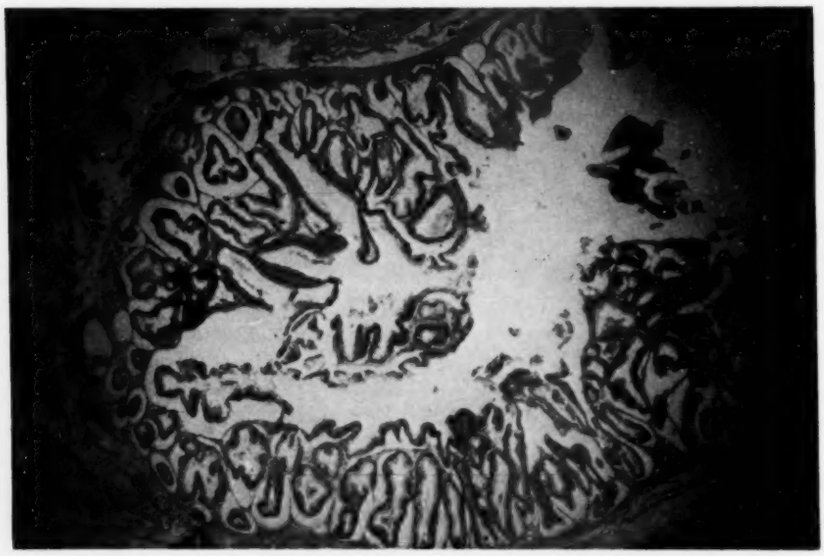

FIG. 2. Specimen, low power, showing lack of invasion; sharp line of demarcation at muscle.

bases. The villi are loosely held together by the sticky, mucoid secretion. As a whole it appears as a spongy mass which is pink or grayish red in color. After removal of the mucus the growth is decidedly red because of the abundant blood supply. The nutrient vessels are larger in size and number than those seen supplying the normal mucosa. Malignant degeneration, when present, apparently occurs in the base and not at the tip, as is common in the usual adenomatous polyp. Histologically, the growth is papillary in appearance. It is covered by columnar epithelium which is actively secreting mucus. We believe that when degeneration occurs it is slow in appearance, slower in invasion and remarkably late in metastasis. (Figs. 1 to 4.) A most scholarly and complete discussion of the pathology has been given by Sunderland and Binkley.[10]

Diagnosis. This is usually made by the gross appearance and by biopsy specimen. Occasionally it is picked up first by x-ray. However, this tumor is one whose site of predilection is nearly always within reach of the proctoscope.

Treatment. Since[7] it has been estimated that approximately 20 per cent of these tumors undergo malignant degeneration, the primary goal in treatment is total removal of all of the tumor tissue. Dukes[9] has stated that after excision of the rectum for cancer approximately 10 per cent of operative specimens in a small series showed definite evidence of carcinoma having developed in a pre-existing villous papilloma.

Recent reports[8] have stated that villous tumors are rarely found above the level of the peritoneal reflection. Six of our cases were in the mid- and lower rectum, and five cases involved the rectosigmoid junction or at a higher level.

In this paper we are particularly interested in those villous papillomas which occur or extend above the peritoneal reflection: in other words, they are very broad-based and extend to or above the 10 cm. level. We believe that these cases are best treated by resection—anterior resection and anastomosis when possible, resection and pull-through, or by resection of the sigmoid, rectum and anus. Since these tumors are remarkably late in invasion and metastasis, it would seem that here is a very excellent indication for proctosigmoidectomy with preservation of the sphincters as was so well demonstrated by Bacon.[5] Presented hereafter are five cases illustrating this type of tumor.

CASE REPORTS

CASE 1. L. McG., an eighty-six year old woman, had prolapsed her villous tumor to the outside when first seen on January 15, 1950, at Kentucky Baptist Hospital. It was covered with a profuse amount of blood-stained, sticky mucus. Much of it was very soft and yielding. The base was firm but not hard. It was replaced and found actually to be in the mid-sigmoid colon. The abdominal approach was used. The

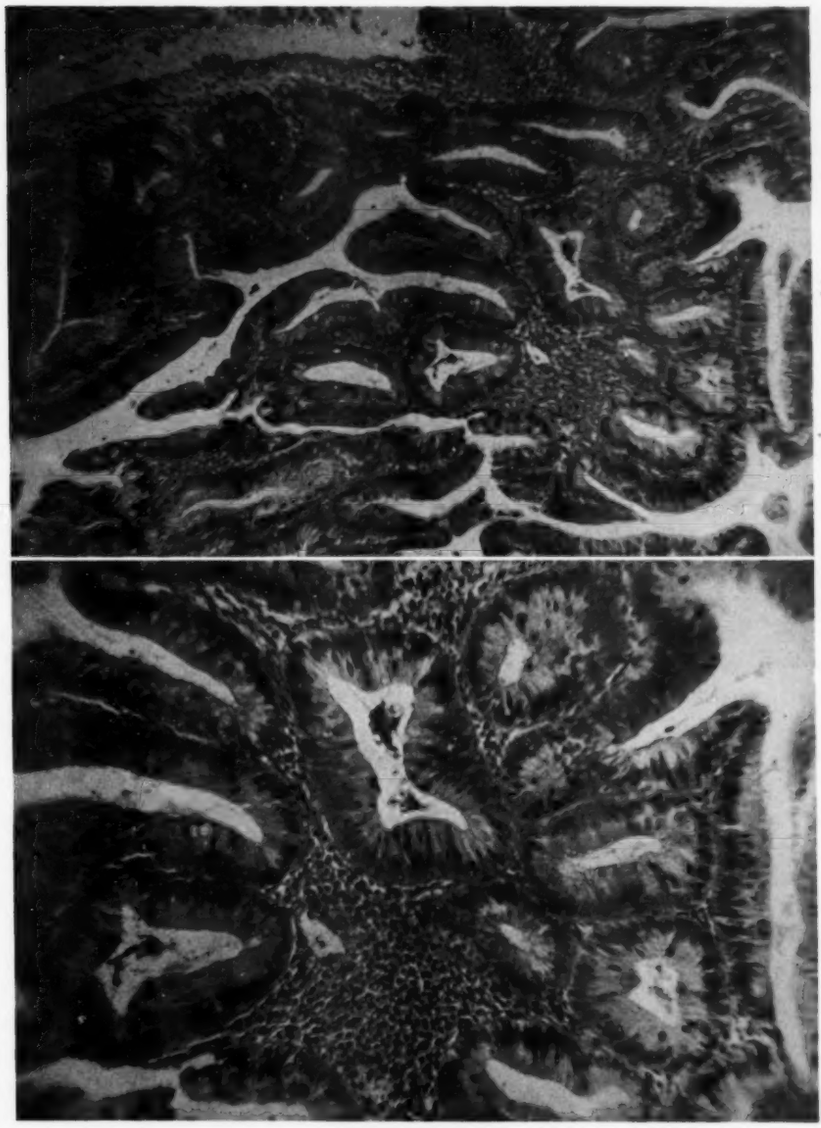

FIG. 3. Shows papillary type of growth of tumor.

FIG. 4. High power to show relatively good differentiation and low grade of malignancy histologically.

sigmoid colon was resected and end-to-end anastomosis performed. Pathologic examination revealed low grade malignancy in papilliferous tissue, with invasion of the muscular coat. No metastases were found. The patient made an uneventful recovery. She was still living and active December 24, 1952.

CASE II. G. T., a fifty-eight year old woman, was first seen in consultation at Norton Memorial Infirmary on September 15, 1951. For five years she had been passing large amounts of blood-stained mucus. During the past two years she had lost 45 pounds. On September 22nd abdominoperineal resection of the sigmoid, rectum and anus was performed. Between forty and fifty enlarged, hard nodes were present in the mesentery. The pathologic report was as follows: "On the lower sigmoid there is a large polypoid area starting 8 cm. from the pectinate line, extending upward for 10 cm. at least, and surrounding and involving the entire lumen of the segment of the bowel. It contains a great deal of red, gelatinous material. Above this there is 16 cm. of normal appearing bowel. Many lymph nodes are palpable. The tumor has invaded the musculature but has not penetrated the serosa. The numerous lymph nodes sectioned show no

evidence of metastatic tumor growth. Numerous additional sections show the tumor to be entirely papillary and not to invade the bowel wall. The pattern is one of very extensive and true malignant papilloma." The patient's recovery was marred by an episode of small bowel obstruction which was relieved surgically. This complication caused her postoperative stay to be three weeks. As of December 24, 1952, she was in good health and had gained between 20 and 25 pounds in weight. This is an example of a case in which the pull-through procedure would have been completely adequate.

CASE III. M. M. was first seen in consultation at Norton Memorial Infirmary on October 12, 1951. A large, fleshy, mucus-covered, fragile tumor mass was found by proctoscopy at the 16 cm. level. Biopsy of a generous portion of the mass was reported as villous tumor. He had had an adenocarcinoma of the splenic flexure resected two years previously by another surgeon in a different hospital. Laparotomy was performed on October 20, 1951. The mesentery of the small bowel was extensively infiltrated by low grade carcinoma. There was direct extension into the retroperitoneal tissues and several loops of small bowel. Transverse colostomy was performed.

CASE IV. G. S. W., a sixty year old woman, was first seen at Kentucky Baptist Hospital on October 31, 1952. Past history revealed passage of mucus and occasionally a blood-stained bowel action for one year. Two days before admission she had had an episode of considerable sudden bleeding at stool. Proctoscopy at the level of 12½ cm. showed a soft, friable, mucus-covered, bleeding polypoid mass. Biopsy was reported as papillary adenocarcinoma of the rectum, grade II, probably arising in a villous tumor or papillary adenoma. On November 5, 1952, her lower sigmoid colon and upper rectum were removed. Anastomosis between the upper sigmoid and rectal ampulla was done. Pathologic study of the surgical specimen confirmed the biopsy diagnosis. Her recovery was uneventful and she was discharged eleven days postoperatively. At the present time she is carrying on all of her normal activities.

CASE V. I. L., a seventy-three year old man, was first seen in consultation at Jewish Hospital. Proctoscopy revealed a very extensive villous papilloma encircling the rectum, beginning at the 8 cm. level and extending to the 18 cm. level. He had been troubled with very frequent passages of mucous stools for about two years and had noted considerable thinning of the bowel action for approximately one year prior to that. For the past two months he had had considerable rectal tenesmus. Numerous snare biopsy removals of fairly large pieces of this tumor revealed only villous papilloma without malignant changes. This man is an excellent candidate for resection and probably a pull-through type of procedure. At present time he is reluctant to undergo surgery.

CONCLUSIONS

1. A discussion of villous tumor, or villous papilloma of the rectum, a rare type of tumor, has not been found in the literature of the field since 1924. Previously these tumors have largely been loosely classified and have been few and scattered in incidence. However, in a large percentage of those reported, a marked tendency to undergo malignant degeneration was noted.

2. This article attempts to bring up-to-date some of the known material about villous papilloma, with use of eleven cases seen between January, 1950 and January, 1953. Five of these cases occurred at or extended to levels above the peritoneal reflection and are discussed fully.

3. Findings indicate that villous papilloma can nearly always be diagnosed by anorectal and proctoscopic examination.

4. Villous papilloma when it does become malignant is of low grade potential, invades very slowly and metastasizes remarkably late. Direct invasion is more probable than metastatic spread.

5. The primary object is total removal of the tumor mass.

6. Extensive tumors of this type present an excellent indication for abdominoperineal resection with pull-through and sphincter preservation.

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DISCUSSION OF PAPERS BY DRS. RYAN AND LUCAS

Benjamin Castleman (Boston, Mass.): I presented before the Basic Science Session a plea for conservatism for the benign mucosal polyps that may have atypical characteristics in the epithelium, something that the pathologists call carcinoma *in situ*. I also made the statement that if the polyp has a definite not man-made pedicle that is free no matter what the surface epithelium shows, the chances are almost 100 per cent that that lesion is a benign tumor and can be removed by snipping off the polyp, thus eliminating the necessity of a sigmoid resection.

However in discussing Dr. Ryan's paper, I think one might take the reverse stand. Villous tumors spread over the surface of the bowel and very often become completely ambulant. From our experience at Memorial Hospital in New York, in about 70 per cent of the cases there are changes that the pathologist has the right to call carcinoma *in situ*. Although these tumors are villous, they do not have the long pedicle with a stalk in them as a rule; therefore, it is important that the entire tumor be removed completely. As Dr. Ryan has described, the tumor spreads in such a fashion that there are almost certain areas of tumor involvement that cannot be recognized by the surgeon or even by the pathologist on a gross examination. Due to the early change in surface epithelium, contrasted to the glandular epithelium beneath the mucosa, he will not be able to see that the tumor has really extended beyond his excision.

For that reason, so many of the tumors that are resected locally or snipped off have been known to recur.

In our series and also the series at Memorial Hospital I believe recurrence after local excision is about 40 per cent, and also the cases that finally develop carcinoma are those that show the carcinoma *in situ* in many of the biopsies and in the excisions.

E. Parker Hayden (Boston, Mass.): I would like to mention one or two points in discussing these papers.

In the first place, there is a very characteristic point in the history which can usually be elicited if one specifically inquires about it. The individual gives a story of going to the toilet in the morning and evacuating first a clear liquid followed by a normal bowel movement. I have always believed that this is a typical history of villous tumor of the rectum.

The question of how to treat these tumors is a matter of the conscience to the surgeon. In the lower tumors it is difficult to determine with certainty whether they are malignant or not, even with several biopsies. A definite impression can be derived from the appearance and from the consistancy of the tumor, but a biopsy is uncertain unless definitely malignant because one cannot be sure whether the proper spot has been biopsied. Therefore, one must decide whether always to take the rectum out for a low villous tumor or whether to take a chance once in a while that an undetected cancer may be present and perform an operation of lesser degree—a complete local removal only.

It is really very easy to get many of these tumors out by splitting the sphincter and ligating the pedicle in sections, but with Dr. Castleman's admonition as to the difficulty of really getting around the tumor, I am sure we should all think carefully of the possibilities inherent in a local removal. I have done many, and successfully, but on the other hand, I have also been fooled and had malignant recurrence develop and fairly often local recurrence of a benign lesion.

In Dr. Lucas' paper four of the five cases mentioned were already malignant so that there was no argument at all as to what should be done. In the high tumors, inaccessible to biopsy through a sigmoidoscope, we cannot be certain of their nature and should always, therefore, be radical and resect with end-to-end anastomosis if possible.

I do believe very strongly that the type of procedure must depend on the judgment and the conscience of the surgeon in each case. We all will see instances in which we want to be conservative. If we are conservative, the burden of carefully following up the patient is entirely on our shoulders. If we are radical, we know we have performed the best possible procedure to prevent cancer appearing later. If we are con-

servative we are taking a chance, but I, personally, will continue to take a chance once in a while in an elderly person and in low tumors where the alternative is resection with colostomy.

F. B. Bowman (Hamilton, Ontario, Canada): I should like to mention one case. One of the discussers has mentioned a case which was reported from Ontario and I think that was a publication of mine. Another patient, seventy years of age, consulted me twenty-one years ago complaining, as is usual, of piles. He had all of the symptoms described by the discussers —discharge of mucus and blood, etc. He had a large villous tumor of the upper rectum. The laboratory reported malignancy, low grade. After several consultations it was decided to treat the condition conservatively.

Under spinal anesthesia the tumor was thoroughly dessicated, several radon seeds were inserted around the margin and the usual postoperative treatment was carried out.

The day before I came to this meeting I took this gentleman for a drive and we had dinner. He is now ninety-two years of age, is perfectly well and has had no symptoms of any rectal trouble since the operation.

It is particularly interesting to me because he happens to be my father.

George E. Binkley (New York, N. Y.): I would like to make a few comments about villous tumors. These interesting lesions might be better termed papillary adenomas.

The villous tumor, as presented at this meeting, is an advanced stage of the papillary adenoma which has involved the greater part of the circumference of the rectum. Treatment of these advanced tumors presents different problems. Complete local removal of these lesions, such as those under discussion, is often impossible. The difficulty may be due to the great degree of rectal involvement or it may be due to the malignant change that has occurred within the polyp. Small or early papillary adenomas usually can be readily removed. Treatment for the large lesions varies. A few may be removed with the electric snare or by local excision. Others may be treated by opening the rectum posteriorly or by the technic described. When the tumor has reached the infiltrating stage, a more radical procedure such as an abdominoperineal resection is necessary.

The objective in all cases must be to eradicate the tumor completely by one of the aforementioned methods. If conservative treatment is tried, a satisfactory result should be obtained within a few months. We have proved that many patients who were treated conservatively without complete eradication of the tumor died of cancer within one to fifteen years. About 68 per cent of our patients with papillary adenomas either had cancer at the time of treatment or developed it before death where conservative treatment was employed. The method of conservative treatment by coagulating or fulgurating a part of these tumors at irregular intervals and never completely eliminating them is to be condemned. Too many patients treated in this way will die of rectal cancer.

Multiple small biopsies as a means of determining the malignancy of these large tumors is not the proper approach. Only by examining the whole or a large part of the tumor will the true picture be presented. Malignant villous tumors low in the rectum are especially vicious. The old rule of "the lower the cancer within the rectum, the poorer the prognosis" holds true for this type of malignant disease.

I cannot agree with Dr. Lucas in his statement that papillary adenomas are rare. They are very common. At present I have two private patients in the hospital with medium-sized papillary adenomas, both of which have undergone some malignant change. Papillary adenomas of this type occur not only in the rectum but also in many locations of the colon. One of our patients had such a tumor in the cecum.

James E. Ryan (closing): Dr. Lucas and I both realize that we have merely given a specter of the subject, but primarily we have attempted not to express any dogmatic views. We agree with both Dr. Hayden and Dr. Binkley that the question of handling villous tumors presents many facets and intangibles which have to be individualized.

Marvin A. Lucas (closing): Dr. Ryan and I thoroughly agree that total removal of the tumor is necessary. The methods will vary according to the tumor, its location, accessibility and the patient.

We have never used radon as Dr. Bowman mentioned.

Dr. Binkley made the point that I hoped he would, that is, we do not think the tumor is really as rare as it has been thought to be in the past. I believe if you look for them you will find them. As a matter of fact, we have found three more since this paper was written.

SURGERY OF DIVERTICULITIS OF THE COLON

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TRENDS in the surgical management of diverticulitis of the colon have changed materially in the past decade. This has been due to a number of factors influencing progress in the treatment of many common disorders. Since diverticulosis is a disease of older people, the steady increase in the average age of the population brings this problem more forcibly before us.

It is not my intention to undertake a discussion of the causes of diverticulosis. Suffice it to say that this peculiar disease is not a respector of any distinct class of people. How it is brought about or how to prevent it, is not too clear. That there are anatomic and possibly congenital faults in the walls of the colon may be admitted. These, however, do not explain why some people have it and others do not. Nor does it answer the question of why it does not manifest itself before the age of forty, and increases in the percentage of persons affected in a direct ratio to advancement in age. Type of diet, bowel habits and mode of life, although at times suggestive of factors influencing the development of diverticula, reveal too many exceptions to make these of much significance.

Studies of 2,000 consecutive patients who had barium enemas at the Massachusetts General Hospital in the past three years reveal diverticulosis of the colon in a third of the cases. This does not imply that every patient admitted for any cause receives this test, and therefore does not give an accurate estimate of the true percentage of the hospital population who may have diverticulosis, much less does it indicate how common the disorder may be in the community as a whole. No cases were seen under the age of thirty-five, and at forty-five 5 per cent had diverticula of the colon. Taking all ages, the per cent values increase to a maximum of 66, with an average of 33 for the whole group. Since the majority of patients examined had some symptoms pointing to the colon, or at least to the gastrointestinal tract, we would naturally need to make these allowances when the community, as a whole, is taken into consideration.

Although it was found that by far the greatest number of lesions were in the sigmoid, there were diverticula present in lesser degrees of frequency in all parts of the colon. For practical purposes, however, we can almost disregard all but the left colon in our discussion.

That these pouches act as traps for food particles, bacteria, and the like, is easy to understand. Doubtless the majority of people who have diverticula do not get acute inflammation of significance, under these circumstances. Some appear to retain radiopaque material for weeks without signs or symptoms of diverticulitis. Also, it is true that when diverticula become acutely inflamed, most of them subside on conservative management. Few, if any, rupture into the free peritoneal cavity in the early stage of the inflammatory process as happens so commonly in acute appendicitis. This difference is due to the location of the diverticula on or near the mesenteric border so that abscess formation is easily walled off. The process must, in many, if not in the majority of instances, drain itself into the bowel. Therefore it is understood why previous concepts regarding the management of the disease came about.

Our teachers were convinced that diverticulosis was not a serious handicap to life because they had observed many patients who had carried on year after year without much trouble. Advice was given concerning the avoidance of roughage and particularly seeds in their diet. Also, they were advised to provide mild lubrication of the region by the daily use of mineral oil. Without doubt such a regimen is helpful in many if not most of the cases. It is true, however, that in spite of strict adherence to such a regimen, periodic episodes of acute diverticulitis developed in many cases. After a few days, or occasionally a few weeks, these acute manifestations subsided, in most of these patients.

Acute diverticulitis may, and often does, progress to abscess formation of considerable extent. This process may gradually absorb, may rupture into the bowel of its source, into

another loop of intestine or into the urinary bladder. Occasionally such an abscess points to the outside through the skin, perforates into the general peritoneal cavity, breaks into the vagina, or even into the ureter. These complications more often occur in subsequent attacks rather than during the first episode.

Exploration, under the diagnosis of acute appendicitis, is most common because abdominal pain, elevation of temperature, rise in leukocyte count, slowing of peristalsis, and abdominal tenderness are present. The occasional acute inflammation of a diverticulum of the cecum can never be distinguished clinically from appendicitis, save in those individuals who have previously had appendectomy. During the first episode of the usual sigmoid diverticulitis, the left-sided tenderness is often explained on the basis of a low-lying appendix with its tip pointing to the left side—a rare but not unheard of situation. If, however, the surgeon finds the true situation to be diverticulitis of the sigmoid, he must use proper judgment or he may first of all lose his patient or, secondly, produce a situation of unnecessarily long morbidity. It is usually better judgment in the early case to leave it alone. With antibiotics, bedrest and time nature will ease such a patient over this hurdle without his being any the worse for the experience. This has proved true in a vast number of such patients treated conservatively.

If, however, the process is of long-standing and one finds a large inflammatory mass, the line of attack should be along quite another pattern. In rare cases there is an obvious abscess that manifests itself by redness of the skin over it, or by finding it recently ruptured into the peritoneal cavity. If such is the case, one is justified in establishing drainage in the flank, in the groin or through the vagina. In addition to this, a complete defunctioning transverse colostomy should be done. If the lesion is incorrectly diagnosed as a hugh, adherent, probably inoperable carcinoma, transverse colostomy as the only immediate procedure is likewise best. This holds true for the large inflammatory obstructing mass of diverticulitis. If one probes about, does biopsies or attempts immediate removal of such lesions, the results will be disastrous. Under no circumstances, when dealing with such large inflammatory areas, whether they are due to cancer primarily or are purely diverticulitis, should a sigmoid colostomy be performed. If this is done, then subsequent definitive operations are greatly complicated thereby.

A three-stage procedure should be planned in all cases of obstructive diverticulitis as advocated by Smithwick.[1] A complete defunctioning transverse colostomy represents the first stage. I formerly thought it was best to place such a colostomy through a transverse incision from the inner border of the right rectus fascia extended through the inner half of the left rectus muscle. This reasoning was based on the dangers of subsequent complications in the "hot area of the abdomen," namely, the right upper quadrant. Acute cholecystitis or duodenal ulcer may require surgery in any adult patient at any time. Since the transverse colostomy may need to function for as long as six months, the likelihood of wishing that this fecal fistula was in another location is a real source of worry to the surgeon. If one can be sure by previous roentgenograms that a near midline colostomy through a portion of the left rectus muscle will not preclude stepping down the splenic flexure, then certainly this location is preferable. If, however, one cannot ascertain the position of the splenic flexure beforehand, or if the entire descending colon is narrowed and studded with tics and scar tissue, then the hazards of a right transverse colostomy are outweighed. Some partial failures requiring reoperation have occurred when the splenic flexure could not be utilized or even removed at the time of the second stage.

One should not allow the patient to persuade us against our better judgment to proceed with the second stage before the optimum time for the definitive resection is reached. Although we should anticipate that six months should be allowed for the inflammatory process in the sigmoid to recede, there are exceptions to this rule. First of all, more rapid resolution of the inflammatory area takes place under antibiotics than was formerly the case before these agents became available. Secondly, there are cases that by a continuation of blood and mucus from the rectum, in spite of a complete defunctioning colostomy, the true nature of the lesion is signified. These symptoms are clearly those of cancer of the colon and a radical attack on the area must be done as soon as the patient has recovered from her obstructive symptoms. Due to errors in diagnosis or to a misinterpretation of symptoms definitive procedures may be disastrously delayed. There is no need for such

mistakes in judgment. If the colostomy is completely defunctioning by complete transection of the bowel and separation of the bowel ends, there will be no appreciable discharge from the distal segment after the first postoperative week. If, however, there is cancer as well as diverticulitis present, the bloody mucus always present under such circumstances will continue daily and proper action can be taken by the second or third week following the colostomy. One should not depend on a loop colostomy for guidance on this differential point. Peristalsis in the distal bowel will suck into that segment part of the fecal matter that is discharged from the active end of the colostomy. Not only does this obscure the true nature of the primary lesion, but also it delays the resolution of a purely inflammatory process. In making a temporary colostomy one should not put too much emphasis on its ultimate closure. Spurs may be successfully crushed and continuity finally re-established in some cases but it is far better to contemplate from the beginning, a third operation. Colostomies are most satisfactorily closed by resection of all scar tissue, an accurate end-to-end suture, and dropping this anastomosis free into the peritoneal cavity. Such a third-stage procedure should be done as soon as feasible after definitive resection of the left colon has been accomplished but never at the same sitting. Often, continuity can be re-established on the tenth day after resection and end-to-end anastomosis of the primary lesion. More frequently, however, two weeks elapse before such a procedure appears justified. We do not routinely assure ourselves of the patency of our anastomosis by barium enema as advocated by some. More often, if water or salt solution goes through readily, we consider this sufficient evidence of patency to warrant closure of the colostomy. If the suture was questionable in the beginning or unusually low in the rectum, or if the convalescence was stormy, one should then wait a longer period and be sure that no fistula exists before closing the colostomy.

Experience with the obstructive type of acute or sub-acute diverticulitis by the three-stage method described previously has resulted in a happy outcome in most of the patients so treated. Having observed an increasing number of individuals who have had diverticulosis over a number of years with and without recurring episodes of disabling acute inflammation, we believe that a more radical attitude should be taken into consideration in this type of patient. There are a good many people who have only minor inconveniences from extensive diverticulosis. Some of them do not become disabled at any time from acute attacks of sufficient severity to warrant any change in their daily mode of life. Others do have repeated short episodes of left lower quadrant pain, slight fever and localized tenderness, usually with some temporary change in bowel habit. These quickly subside with bedrest, liquid diet and, nowadays, nearly always a short course of chemotherapy or antibiotic treatment. Advice is usually given about low residue diet and bowel lubrication so that there are no sequelae of significance until the next acute attack comes out of a clear sky a year or even several years later.

Some such patients will have periods of bleeding from the bowel. There is always in their minds, as well as in the thinking of their physicians, that bleeding means cancer. Thus after each episode of bleeding a thorough check with sigmoidoscope and barium enema is carried out. It has often been said in the past that diverticula of the colon do not cause blood in the stools, and also that cancer of the bowel and diverticulosis rarely, if ever, occur in the same patient. These former concepts have been completely disproven. Massive hemorrhage occurred in one of our patients a year after removal of the sigmoid for diverticulitis requiring extirpation of the remaining colon which contained numerous diverticula up to the ileocecal valve. Twenty-seven per cent of all the patients in whom resection was performed have bled to some extent. Cancer of the colon does develop in patients with diverticula, as indicated previously, and may in fact be the precipitating factor in the acute obstructive process. We do not have evidence that cancer occurs more frequently in the presence of diverticulosis than in the average patient, but we are sure that diverticula of the colon do not in any way act as a safeguard against the development of cancer. Needless to say, these two distinct pathologic processes are entirely unrelated in origin and development. Simply knowing a patient to have diverticulosis of the colon does not permit us to interpret his symptoms of cancer on any benign basis.

Many patients with diverticulosis go throughout a long life span without having an intolerable situation from this source arise. On the other hand, over a period of years, many of

them, either with or without disabling short episodes of acute manifestations, develop gradually chronic obstruction. As such individuals are followed, one is impressed with the increased narrowing of the sigmoid with a definite dilation of the right colon. Discomfort from such a situation may in fact be largely that of right-sided pain. Others without very much evidence of acute inflammation suddenly become aware of gas and fecal matter coming from the urinary bladder. Some finally become so nearly obstructed that something must be done to relieve them.

Although there may be a long-standing low grade inflammatory process going on in the left colon without obstructive symptoms, more and more of these patients are seen with a chronic invalidism that warrants correction. As any inflammation heals, scar tissue results. When such a process is repeated, time after time, a fixed narrowing of the bowel occurs which is of significance. This may be a fairly localized area involving only the sigmoid loop. Often, however, it may involve the whole left colon. If these patients can be subjected to resection of the involved bowel with immediate end-to-end suture, they will have a short convalescence and complete relief. It is our belief that more such individuals should have this form of treatment at a time of election, and before complete obstruction or urinary fistula develops. The decrease in morbidity is striking —three weeks in the first instance as compared with three or more months in the other.

We are certain that the anastomosis should be made between bowel ends that are free of inflammation. This often means the distal transverse colon to the rectosigmoid. Formerly we were of the opinion that elimination of the most seriously involved sigmoid flexure alone would be satisfactory. It is true that diverticula left in the straight descending colon often fail to produce disabling symptoms, but they do on occasion and sometimes make a secondary resection necessary. Now with the increasing age of the patient we more often find the entire left colon scarred and narrowed. Under these circumstances this whole area should be eliminated. The average measurement of the resected specimen should be approximately 20 cm.

Few of our resections in recent years have required complementary cecostomy or transverse colostomy. If there is doubt about the integrity of the anastomosis, then such a precaution should be taken. We prepare these patients in the same manner as we do those who are about to have resections for cancer. Sulfathaladine, 8 gm. daily, is administered for five days. We think at this time that the risk of having the virulent staphylococcus unaffected by the preliminary chemotherapeutic and antibiotic agents come into play is outweighed by the added safety in bowel resection when these agents are used preoperatively. We do culture the bowel contents at operation and if staphylococcus is present, we use the most effective antibiotic against it.

Gastric suction is established before anesthesia and maintained until gas passes through the anastomosis, which is usually about three days. A low residue diet is gradually given as peristalsis returns. Fluids and electrolytes are maintained intravenously. Bowel movements begin between the fifth and seventh postoperative days. A certain degree of temporary looseness of the bowel movements is expected after chronic obstruction.

Our experience in this field covers 114 patients who have undergone resection during the past decade.[2] There were three postoperative deaths. Two of these were in our early cases and due to technical errors. One patient succumbed to pneumonia five days postoperatively. Sixty-five of these patients were operated upon during the acute phase of inflammation or obstruction by the three-stage technic; six had two-stage operations; forty were subjected to the one-stage procedure in the chronic phase of the disease. Five patients had carcinoma of the left colon as well as diverticulitis. The results were gratifying in all survivors, although three required further resection for complications of hemorrhage (one case) and higher diverticula. The last two early cases had had altogether too short a segment of bowel resected.

A few continue with minor symptoms from retained diverticula. On the whole this attitude of attack if well planned and carried out as outlined will be met with gratification on the part of the patient and the surgeon.

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ACCIDENTAL VACCINATION ABOUT THE ANUS

CASE REPORT

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VACCINATION is an accepted procedure for the production of immunity against smallpox. Following the application of vaccine a local reaction ensues consisting of the formation of a papule, vesicles, pustules and crusting. The end result is a pink scar which eventually blanches and becomes pitted. The exudate which arises in the lesion is infectious so that contact with other parts of the body or with other non-immune individuals may result in further vaccination. This accidental type of vaccination occurs rarely about the anus.

1

2

FIG. 1. Ulcerative lesion about the anus two weeks after vaccination on the arm. Note the symmetry of the ulceration and the definite line of demarcation.

FIG. 2. Three weeks after vaccination soft crusting is in evidence.

CASE REPORT

A five and a half year old boy was vaccinated on his left arm on June 9, 1952. Five days later a large papule with red areola developed at the site of vaccination. The following day the child complained of anal pain. At this time the mother noted redness and swelling for a distance of 1 inch about the anal orifice. The temperature was 101°F. and the child complained of feeling chilly. On the seventh day small vesicles appeared about the anus. Chills developed and the temperature reached 103°F. The patient was seen by his pediatrician who believed that the perianal lesion was an accidental vaccination. After two days of bedrest and symptomatic therapy the patient became afebrile.

During the following week "pus sores" developed about the anus. These ruptured and

discharged a thick yellowish purulent material. The anal pain continued to be severe especially on defecation and on walking. There was no further fever. Bowel movements were normal.

The boy was seen in consultation on June 23, 1952, two weeks after the original vaccination and eight days after the first perianal manifestations. (Fig. 1.) There was a shallow ulcerative lesion symmetrically located for a distance of 1 inch about the anus and surrounded by a definite red line of demarcation. The ulcerated tissues were tender and were covered with a yellowish purulent discharge. Outside the line of demarcation there was a zone of redness which extended for another inch. The inguinal glands were small and tender. Digital exploration of the anal canal elicited severe pain. With the help of a small speculum the anal canal and lower rectum were visualized and appeared to be normal. Aureomycin ointment was prescribed for local application.

On June 30, 1952, the extent of the perianal ulceration was unchanged. There was evidence of granulation tissue and healing, and only slight redness. (Fig. 2.) A few small red papules were visible posteriorly about the ulceration. During the following two weeks healing took place leaving a smooth pink scar. There was no evidence of contracture or other ill effects.

The diagnosis of accidental vaccination about the anus is made by the appearance of a localized vesiculopustular lesion followed by ulceration in a non-immune individual exposed to smallpox vaccination. Complicated diagnostic procedures such as skin biopsy and examination with the electron microscope, inoculation of a rabbit's cornea with seropurulent discharge and serologic determination of antibody formation are impractical. Impetigo and chancroid should be considered in the differential diagnosis.

SUMMARY

A case of accidental vaccination about the anus due to autoinoculation is reported. The lesion undergoes the same sequence of changes as in the customary smallpox vaccination except that the crusting is soft and moist. There is severe anal pain especially on defecation, walking and sitting. In the absence of secondary infection the prognosis is good. Treatment is non-specific.

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PAGET'S DISEASE OF THE ANUS*

CASE REPORT

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SINCE Sir James Paget in 1874 first described the mammary lesion which he called Paget's disease, there have been only seven cases reported in which the same lesion has appeared in the perianal area. There has been much controversy as to whether Paget's disease is a primary disease *per se* or a manifestation of an underlying disorder. Most authors agree now that Paget's cells are cancer cells from the onset and are intraepidermal metastases from underlying glandular carcinoma. This report of a case of Paget's disease of the anus presents a primary carcinoma of the apocrine glands, with metastasis by way of the lymphatics to many areas of the body.

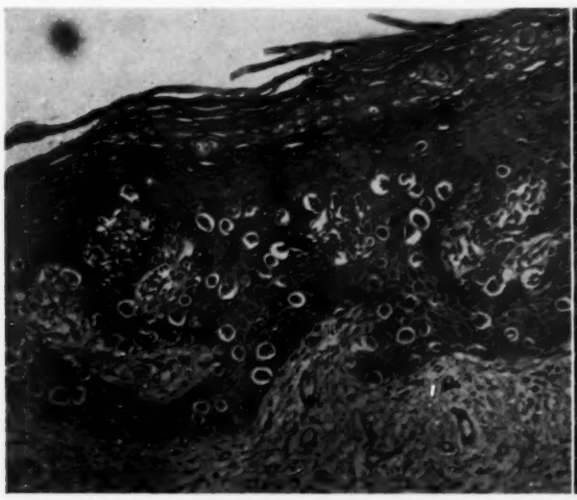

FIG. 1. Photomicrograph of section of perianal skin showing Paget's cells.

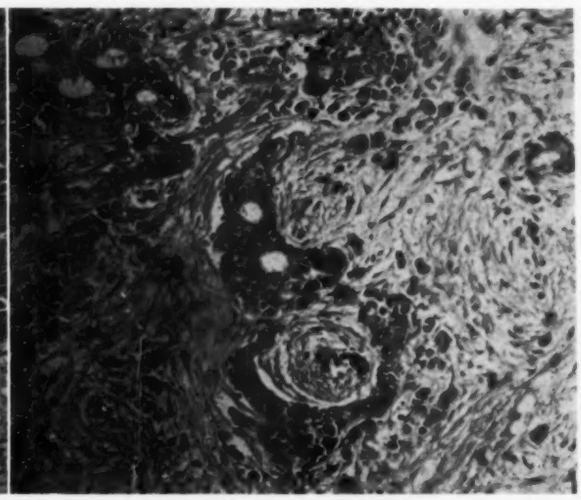

FIG. 2. Photomicrograph of section of left inguinal gland, showing metastatic adenocarcinoma.

CASE REPORT

S. R., a male Negro, age sixty-eight, was first seen by us June 29, 1950, at the Proctologic Clinic of the Indianapolis General Hospital. At a previous admission in April, 1949, with a complaint of pruritus ani, a biopsy of the anal area was made with a diagnosis of "chronic and acute inflammation of the skin." At that time induration of the left anus of six months' duration was present. He received x-ray treatments, washes and ointments with no improvement.

Anorectal examination at this time revealed a thickening and hardness of the perianal skin in a crescent, from the anterior midline around the left half of the anus to the posterior midline. This began 1.5 cm. anteriorly, was 10 cm. in breadth mid-laterally and 2 cm. posteriorly, and extended up to 2.5 cm. from the mucocutaneous junction of the anorectal canal. The edges were sharply defined. The superficial epidermis of this entire area appeared to be normal but was very painful on light pressure. The skin on the right half of the anus was thin, parchment-like and was slightly scaly, but with no ulceration, no cracking of the skin, no discharge and no pain on pressure. A posterior fissure with an inflamed sentinel pile was observed. Bilateral enlarged inguinal glands were palpated.

At surgery on July 9, 1950, a skin of 2 cm. in thickness with appearance of neoplastic in-

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vasion was excised back to normal skin. The transition from normal skin to abnormal skin was well defined. Subcutaneously there was no invasion of the fatty layer. The biopsy report on this specimen was "carcinoma of the skin (epithelium and corium) associated with Paget's disease of the epidermis."

A biopsy taken two days later from the right anus also contained Paget cells. Biopsy of the mucous membrane of the lower rectum showed no Paget cells.

Sections of these biopsy specimens were examined by several pathologists all of whom concurred in the diagnosis of Paget's disease. (Fig. 1.)

On July 28, 1950, an enlarged node from the left inguinal area was excised and biopsied. This report showed metastatic adenocarcinoma, highly undifferentiated, probably metastatic from Paget's disease of the anus. (Fig. 2.)

On August 11, 1950, a combined abdominoperineal resection was done, with a radical left iliac node dissection at the same time. A wide excision of the entire perianal area was done. The pathologic report listed: (1) Paget's disease of the skin and anus; (2) adenocarcinoma, highly undifferentiated, of the apocrine glands with iliac node metastasis. On September 11, 1950, a radical dissection of the right inguinal and iliac lymph nodes was done, with a simple dissection of the left inguinal nodes. The pathologic report was the same, with metastasis to one of four right inguinal nodes, with negative left inguinal nodes. His wounds healed well. He was released on October 12, 1950.

He was seen several times in the Proctologic Clinic during the next year and was active, working and apparently in good health. Biopsy of the anal skin in December, 1950, showed no Paget cells.

His last admission to the hospital was on October 5, 1951, when his hospital course was one of a rapidly progressive decline. He died October 9, 1951.

An autopsy was obtained with the following positive findings: (1) Paget's disease of the anus with generalized metastasis to both inguinal nodes, both iliac fossae, right ureter and renal pelvis, right perinephritic region, large and small bowel mesentery, lumbar vertebrae, all layers of the heart; (2) saccular aneurysm of descending thoracic aorta with a malignant metastatic nodule in the wall of the aneurysm; (3) pulmonary edema with bilateral bronchopneumonia. No other primary malignancy was found in any portion of the body structures.

COMMENT

A review of the literature reveals seven proven cases of Paget's disease of the perianal area. One case is added which was observed over a period of three years, with autopsy findings. The evidence presented here seems to prove that it is not necessary for a patient with Paget's disease to have an associated distinct carcinoma. The condition seems to be a separate disease entity, namely, a primary carcinoma of the apocrine glands with metastasis by way of the lymphatics to many areas of the body.

MULTIPLE CARCINOID OF THE RECTUM*

CASE REPORT

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THE rectum is an unusual site for carcinoid growths. In April, 1951, Mayo and McKee,[1] in reporting two such cases, stated that they could find reference to only sixty-four others in the combined world literature prior to the time of their writing. Multiple carcinoid lesions were found in only three of these cases and in two of these three the discovery was an incidental autopsy finding.

Carcinoids of the rectum are non-encapsulated but definitely circumscribed submucosal tumors and they may be polypoid. The cut surface is characteristically yellow in color. Although they are usually of low-grade malignancy, they should not be so classified since there are apparently two microscopically indistinguishable types of rectal carcinoid.[2] The first of these, by far the more common, remains as a slow-growing localized lesion. The second type is genuinely malignant in the true sense of the term, demonstrating early and widespread metastases. It is also interesting to note that many of the rectal carcinoids are not true "argentaffinomas" in that silver compounds are not reduced by their cytoplasmic granules.[3,4]

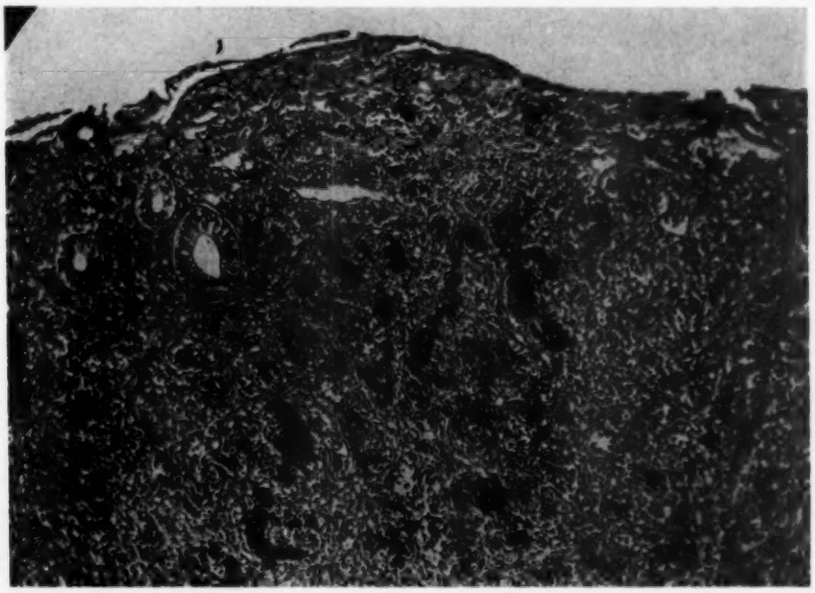

FIG. 1. Photomicrograph of tissue section taken from biopsy of caudad tumor; × 153.

Microscopically, a typical carcinoid tissue section shows cells huddled in nests and columns of variable size in the submucosa. While the nuclei are rather small, round and hyperchromatic, the cytoplasm of these cells is unusually pale.[4,5]

CASE REPORT

J. R., a fifty-two year old white male of Puerto Rican origin was admitted to Bellevue Hospital on September 27, 1951. He complained of lower abdominal and left paraumbilical pain of forty-eight hours' duration, accompanied by moderate diarrhea. His past history was of no significance.

Physical examination was essentially negative except for the rectal findings. Anal inspec-

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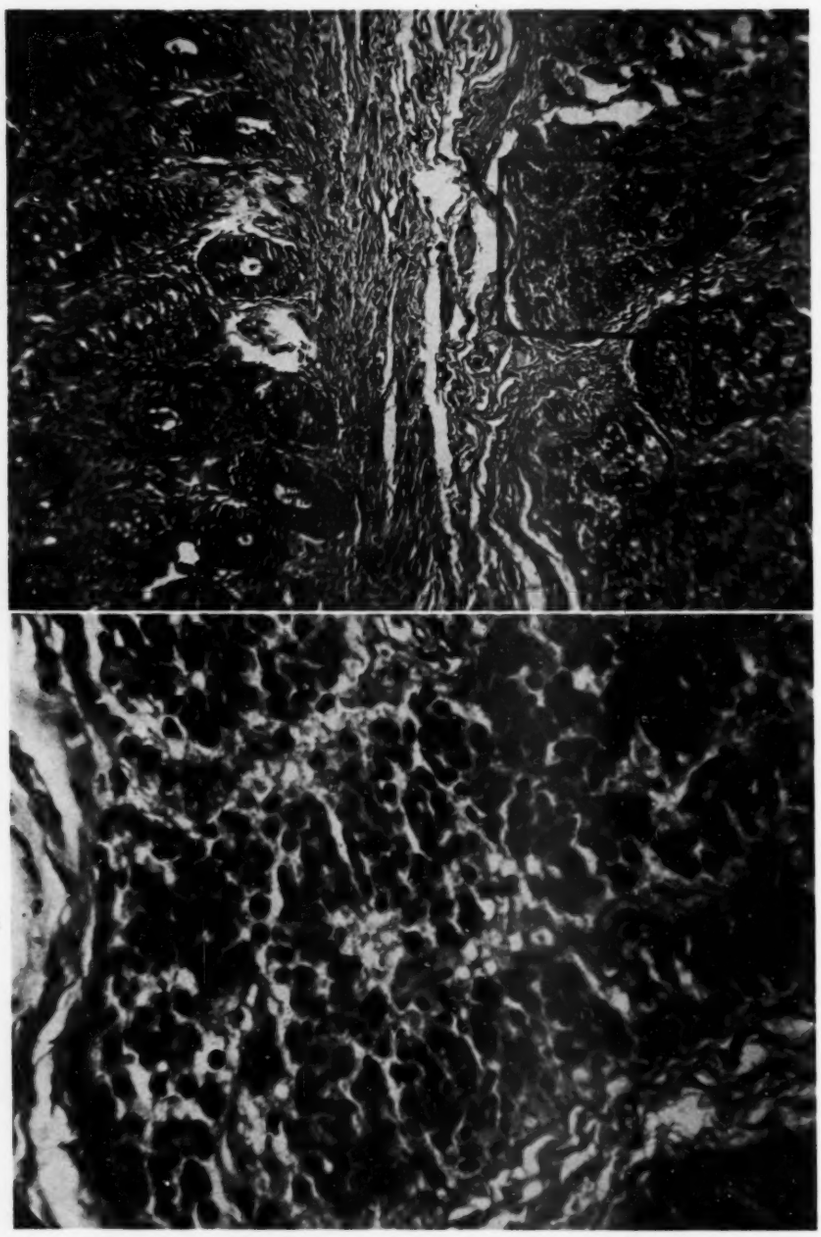

FIG. 2. Photomicrograph of tissue section taken from cephalad tumor; × 172.

FIG. 3. Photomicrograph of tissue section taken from cephalad tumor; insert of Figure 2; × 690.

tion was negative. Digital examination revealed a moderately enlarged, somewhat tender prostate. At 5 cm. from the anal verge on the posterior rectal wall one could palpate a pea-sized, sessile polypoid structure which was soft and easily movable. Two cm. cephalad to this lesion a smooth, rubbery, movable mass approximately 1.0 cm. in diameter was felt. It was non-tender and apparently submucosal. Immediately to the right and above this mass another structure similar to the first but approximately 2 by 3 cm., was felt.

Endoscopic examination performed with the patient in both the left lateral and the deep tilt positions was entirely negative to 22 cm., except for the small polypoid structure felt on digital examination. Grossly it appeared to be a benign sessile rectal adenoma.

Routine urine and blood studies were entirely normal except for an eosinophil count of 15

per cent. Hemoglobin was measured at 14.5 gm., with red blood cells of 5,060,000 and white blood cells of 8,300. Examination of feces revealed ova of hookworm. Barium enema x-ray studies on October 5, 1951, were entirely normal.

On October 6, 1951, the small polypoid structure was removed by electric snare and a punch biopsy of the more caudad of the two submucosal tumors was taken. The former was reported by the pathologist as "benign adenomatous polyp"; the latter was reported as showing an inflammatory process although there appeared to be clusters of submucosal cells which resembled carcinoid cells. (Fig. 1.)

As a result of intercurrent upper respiratory infection it was not until November 19, 1951, that surgical excision of the posterior rectal tumors was attempted. By this time there appeared to be some narrowing of the rectal lumen as a result of encroachment by the tumor masses. Excision was performed under spinal anesthesia through a vertical midline incision from the sacrum to a point 1 inch from the anus. The coccyx was removed. The separation of rectum from perirectal tissues was attended by great difficulty because of the presence of firm fibrous tissue. In the process of separation the rectum was inadvertently opened at two points. These rents were closed with fine silk sutures and the wound was packed with two gauze pads in a rubber dam. A transverse colostomy was performed. The masses were removed in three fragments totalling approximately 10 gm. The tissue was subsequently reported by the pathologist to be definitely "carcinoid." (Figs. 2 and 3.)

The colostomy was opened on the third postoperative day and the perineal drain removed on the fifth postoperative day. Because of persistent postoperative urinary retention requiring constant catheterization, the patient was transferred to the urologic service where he had a transurethral resection, 10 gm. of prostatic tissue being removed. On March 27, 1952, the patient was transferred back to the general surgical ward for closure of the colostomy. This procedure was carried out on April 18, 1952. On the second postoperative day a wound dehiscence was observed. Reclosure of the wound with through-and-through tension sutures of metal alloy was successful.

The patient was discharged from the hospital on May 16, 1952, with normal functioning gastrointestinal and genitourinary tracts and in a good state of nutrition. When last seen in the outpatient department on June 24, 1952, digital examination was negative except for slight cicatricial induration of the posterior rectal wall. However, the rectal lumen was very adequate throughout its length.

SUMMARY

A case of multiple carcinoid tumors of the rectum, treated by local excision through a retrorectal perineal approach, is presented.

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ADENO-ACANTHOMA OF THE RECTUM

CASE REPORT

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ADENO-ACANTHOMA, a tumor containing squamous as well as glandular epithelium, is a rare lesion encountered in the uterus, ovaries, stomach, gallbladder and lungs. It is even rarer in the rectum and sigmoid colon. In reviewing the literature we have found four cases primary in the rectum[1,2] and two in the sigmoid colon.[3,4] The squamous epithelium in these adeno-acanthomas is said to be a "metaplastic change" the nature of which is undetermined.[5,6] Fourteen cases of pure epidermoid carcinoma of the rectum[1,7,8–11] have been reported.

1

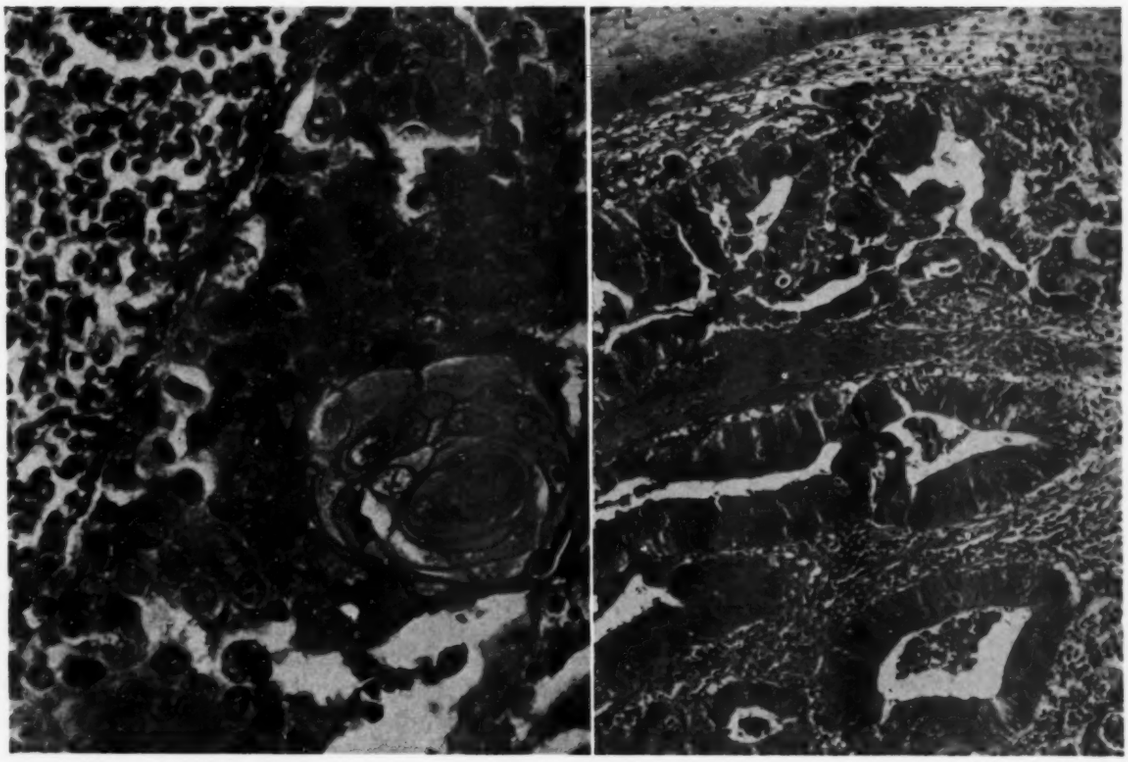
2

FIG. 1. Section of biopsy specimen which includes both adenocarcinoma to the right and undifferentiated carcinoma to the left; × 50. FIG. 2. Section of rectum showing ulcerated, undifferentiated carcinoma; × 20.

CASE REPORT

R. H., a forty-one year old white married woman consulted me in October, 1950, with the chief complaint of change of bowel habit. The family history was negative and the past history revealed no serious illnesses or operative procedures. For about four months she had observed an increase in bowel frequency. The stools, though formed, had occasionally shown bright red blood.

The physical examination was entirely negative. The anal canal and perianal region revealed no abnormalities. In the rectum, just within the reach of the finger on the left posterior wall, a firm rounded tumor the size of a large grape was felt. It was sessile and partially fixed to the submucosa. The surrounding mucosa was not indurated. Sigmoidoscopy revealed the tumor to be about 9 cm. from the anal margin. No gross ulceration or bleeding



3 4

FIG. 3. Section of perirectal lymph node with an "epithelial pearl," carcinoma metastasis and several mitoses; × 475. FIG. 4. Adenocarcinoma about colostomy stoma; × 80.

was noted. The appearance suggested a papilloma or adenocarcinoma and a biopsy was taken.

Microscopic examination showed neoplastic glandular tissue the cells of which were columnar, parallel to one another and exhibited hyperchromatism. In two of the fragments (Fig. 1) there were, in addition to the glandular neoplastic tissue, neoplastic cells appearing as cords of tightly packed cells with scanty intervening stroma. No transitional areas between these two types of neoplasm were noted. The diagnosis of the biopsied tissue was adenocarcinoma of the rectum.

Abdominoperineal resection was performed on November 1, 1950. The liver was normal to palpation, the pelvic adnexa were negative and there was no gross involvement of mesenteric nodes. Several minor complications prolonged the patient's convalescence. She left the hospital in good physical condition on November 30, 1950.

Pathologic report of the specimen was as follows: grossly the specimen consisted of a segment of rectosigmoid including the anus. On the left lateral wall, 4.5 cm. from the anorectal line, was a round plaque 2.5 cm. in diameter. Cut section revealed that the muscularis was not invaded. There was a lymph node which revealed a firm mass of neoplastic tissue.

Microscopic examination showed that adjoining and partly replacing the normal mucosa were compact masses of round or oval cells with distinctly basophilic nuclei and cytoplasm. (Fig. 2.) Submucosal lymphatics were filled with these cells. The tumor did not extend into the mesentery. The lymph node contained masses of neoplastic cells similar to those seen in the rectum. In some areas these cells formed pearl-like nests with poor keratinization. (Fig. 3.) On careful search a few cells with spines were found in the lymph node and in the primary tumor (Grade IV). Glandular neoplasm was not found in any of the sections. Diagnosis was epidermoid carcinoma of the rectum and metastatic carcinoma of perirectal lymph node.

Three months following operation the patient developed deep jaundice which slowly disappeared in four weeks. During this time islands of granulation tissue were noted in the abdominal wound adjacent to the colostomy.

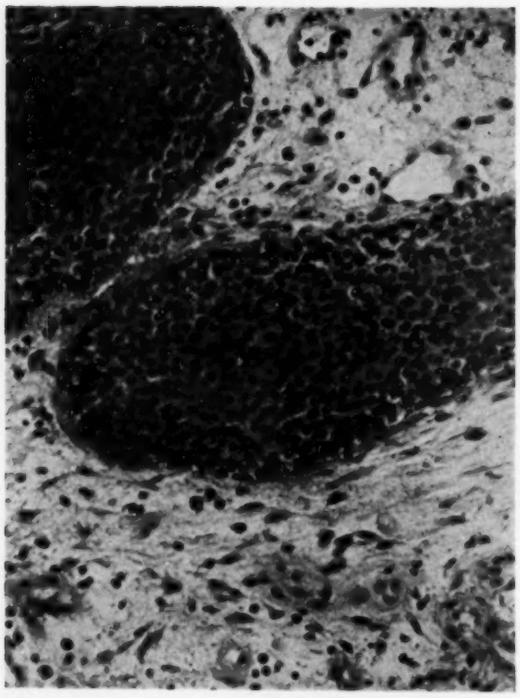


FIG. 5. Biopsy of perineal sinus tract showing undifferentiated carcinoma found in the original tumor; × 150.

When these recurred after cauterization, a biopsy was taken which revealed adenocarcinoma with no undifferentiated type of cells. The area of involvement, together with the exteriorized bowel, was excised *en masse* and a new colostomy created. Manual exploration of the abdominal cavity revealed no evidence of peritoneal, hepatic or lymph node metastases, nor was there any evidence of a second primary tumor in the large bowel. The wound healed by primary intention.

Microscopically (Fig. 4) the sections taken through the skin margin showed adenocarcinoma with no undifferentiated tumor found. The glands were composed of dark basophilic-staining cells with pleomorphism of size, shape and staining quality. There were scattered mitotic figures throughout. The diagnosis was adenocarcinoma about the colostomy stoma.

The patient was readmitted on December 26, 1951, with a history of discomfort in the perineal region for the past two months and a 5 pound weight loss. She experienced difficulty in sitting due to a tender lump in the perineum. At the anterior margin of the perineal wound there was a defect with firm papillary tissue at the base of a crater. The distal half of the posterior portion of the vagina was lifted anteriorly and there was a fixed mass which had eroded through the vaginal wall from the base of the perineal wound. There were no enlarged inguinal nodes. A biopsy was taken.

Pathologic examination (Fig. 5) revealed undifferentiated carcinoma resembling the nonglandular component of the adeno-acanthoma and no well differentiated adenocarcinoma.

On May 30, 1952, the patient was readmitted for study as to the advisability of cordotomy for the relief of pain. After consultation with the Neuro-Surgical Service, this procedure was not advised. At this time her liver was palpable. She was readmitted on August 1, 1952, for the specific purpose of receiving experimental chemotherapy for terminal advanced carcinoma. There was no appreciable benefit from seven intravenous doses of a phosphamide. On this occasion the liver was felt 4 cm. below the right costal margin and an irregular mass was felt in the abdomen in the left lower quadrant below the colostomy. The patent was discharged to a hospital for terminal care where she succumbed in October, 1952. An autopsy was not obtained.

COMMENT

This neoplasm was considered an adeno-acanthoma for the following reasons: (1) the original biopsy showed two types of tumor, one of which was adenocarcinoma and one consistent with an undifferentiated epidermoid carcinoma; (2) the main specimen in its lymph node metastases showed epithelial pearls consistent with epidermoid carcinoma; (3) two separate and distinct metastases showed two different types of tumor, namely, the adeno-carcinoma and the undifferentiated epidermoid carcinoma.

SUMMARY

1. A case of rarely occurring adeno-acanthoma arising in the rectum, independent of the anorectal line, is presented.

2. The prognosis of this type of lesion is very poor.

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CARCINOMA ASSOCIATED WITH ANORECTAL FISTULA

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THE literature reveals that sixty-four cases of carcinoma associated with anorectal fistula have been reported to date. Therefore, it would appear that this is a relatively uncommon occurrence. Each case should be reported in the literature to throw more light on the subject. We understand that for a case to qualify, a true anorectal fistula must be present with no evidence of carcinomatous change about the primary opening. Considerable controversy exists concerning etiologic factors pretaining to this entity. Kraske[1] stated in 1907 that there was no satisfactory evidence that cancer ever arises from a fistula. This view has been substantiated up to the present era by authorities such as Ewing.[2] Rosser[3] disagreed and presented evidence that malignant change may occur in a chronic anorectal fistula if the following criteria were satisfied. First, the fistula should have existed long enough to exclude a reasonable possibility that it had been antedated by the carcinoma. Second, a tumor should not be present in the anorectum unless this is definitely secondary. Third, the primary opening should be in an anal crypt and not in malignant tissue. Skir[4] suggested that an arbitrary period of ten years should be sufficient to eliminate the doubtful cases. Since the extensive clinicopathologic study of the anal ducts reported by Tucker and Hellwig[5] in 1934, it has been suggested[6] that fistulas and malignant change thereof may arise from these glandular structures. It is the purpose of this paper to report another case of carcinoma associated with anorectal fistula.

CASE REPORT

C. H. D., age sixty-four, presented himself for examination on October 6, 1952, complaining of pain and swelling near the anus. He had had no previous anorectal trouble until approximately two years before when, on several occasions he noted a malodorous discharge on his nightclothing on awaking in the morning. No further symptoms were evident until ten days prior to examination when a painful swelling appeared on the left perianal area. This became progressively more pronounced until three days before his visit. At that time the swelling ruptured and profuse drainage occurred which produced immediate relief. Two days later, because the drainage persisted, he consulted his family physician who referred the patient to us for treatment of what appeared, grossly, to be an anorectal fistula. Examination revealed that the patient was a rather flabby male who appeared somewhat older than his stated age of sixty-four. Inspection of the perianal area showed an old, chronic, fistulous opening located 3 inches left anterior to the anal verge. In the left lateral quadrant was a large, raised, indurated area with a fresh sinus located in the central portion of this about 2½ inches posterior to the other opening. Both of these sinuses connected with a large internal opening located at the base of the crypt in the left anterior quadrant. An unusual degree of induration was present about the primary opening, deep to the mucous membrane. Otherwise, it was not unusual. Surgery was performed on October 7, 1952. The tracts were laid open. They were lined with a thick, friable, gelatinous material. The upper tract terminated in a superficial cavity which contained a clear, serous-appearing fluid. The amount of fibrous tissue laid down about the tracts was unusually dense. This was especially true in the region of the internal opening which, in this location, measured 2 inches in thickness. The tracts and adjacent scar tissue were completely excised and the wounds left open. Tissue examination showed adenocarcinoma grade 1. The advisability of more extensive surgery was carefully considered but it was decided against because of the low-grade nature of the growth. The excision was believed to be complete. We were also guided in this decision by previous favorable reports from local excision procedures in similiar cases. The wound healed in an uneventful manner. He will be checked at frequent intervals. To date he remains free from recurrence.

SUMMARY

Sixty-four cases of carcinoma associated with anorectal fistula have been reported to date. The etiologic factors pertaining to this entity are discussed and another case is reported.

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PRESENT STATUS OF THE TREATMENT OF PILONIDAL SINUS DISEASE*

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THE treatment of pilonidal sinus disease has been in the past and continues to be one of the most controversial subjects in the field of proctology.

In 1936, Kleckner[14] reported a series of over 4,000 cases collected from the members of this Society. In 1947 Rosser and Kerr[28] reported, before the Section on Gastroenterology and Proctology of the American Medical Association, an experience gathered primarily from members of this organization. During 1951 and the first half of 1952, fifteen articles on the subject have appeared in the American literature representing the differences of opinion which continue to exist.[3,6–8,12,15–18,21–23,26,30,31] This report has been prepared in an attempt to ascertain what, if any, progress has been made in our approach to this problem in the past few years. Liburt,[20] Bacon[1] and Turell[30] have recently written excellent reviews on this subject.

TABLE I

METHODS OF TREATMENT OF PILONIDAL SINUS DISEASE
(American Proctologic Society)

1. Excision only	81 replies	33 %
Recurrences, 0–5 %	Average	2–3 %
Days in hospital, 3–10	Average	5–7 days
Days out of work, 7–30	Average	12–14 days
Healing time (4 replies)		3–8 wk.
Number of cases reported	6,625	26 %
2. Marsupialization	44 replies	18 %
Recurrences, 0–10 %	Average	2–4 %
Days in hospital, 1–10	Average	5-7 days
Days out of work, 7–30	Average	14 days
Number of cases reported	5,025	20 %
3. Excision only (limited or partial closure)	37 replies	15 %
Recurrences, 1–10 %	Average	3–4 %
Days in hospital	Average	4 days
Days out of work	Average	14 days
Number of cases reported	5,885	23 %
4. Excision, 80–100 %; excision and closure, 1–20 %	44 replies	17 %
Recurrences, open operation, 0–10 %	Average	5 %
closed operation, 1–15 %	Average	5–7 %
Days in hospital, closed operation	Average	12–14 days
Days out of work, closed operation	Average	21 days
Number of cases reported	3,876	15 %
5. Excision, less than 80 %; excision and closure, over 20 %	42 replies	17 %
Recurrences, open operation, 0–10 %	Average	7–10 %
closed operation, 1–20 %	Average	5–7 %
Number of cases reported	3,908	15 %

A questionnaire was sent to all members of the American Proctologic Society and 51.5 per cent, representing 25,320 cases, have replied. The results of this questionnaire are tabulated in Tables I and II. In addition to the material gathered from this questionnaire, 123 cases treated at the clinic during the years 1946 to 1952 were reviewed. This latter series is insignificant compared with the vast experience of this Society, but it was believed that the knowledge gained from a study of these patients treated under our personal supervision would be helpful in interpreting the results of the questionnaire. Data other than that relating to the treatment of pilonidal sinus disease are not considered in this presentation.

TABLE II

TREATMENT OF PILONIDAL SINUS DISEASE
(Summary, American Proctologic Society)

Type of Operation	Replies		Cases	
	No.	Per cent	No.	Per cent
A. Open operation (various technics)	162	65	17,536	70
B. Closed operation in selected cases	86	35	7,784	30
Total	248	..	25,320	..

Our members have been most cooperative in answering the questionnaire and we have been appreciative of the very prompt replies and the many comments which were enclosed. It is not possible to report all the excellent notes and suggestions which were included. Rather, in this article, we have attempted to generalize the attitudes expressed.

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Thirty-three per cent of our members who answered the questionnaire, representing 6,625 patients or 26 per cent of the cases reported, favored excision only in the treatment of this condition. Fifteen per cent, representing 5,885 patients or 23 per cent, favored a limited excision, a simple unroofing or partial closure. Eighteen per cent, representing 5,025 or 20 per cent of the cases reported, performed a marsupialization procedure.[5,9,14,19] Seventeen per cent, representing 3,876 patients or 15 per cent of the reported total, performed an excision and primary closure in selected cases but in less than 20 per cent of all their patients. The remainder were treated by excision, or on occasion a partial closure or a marsupialization technic was utilized. Seventeen per cent of our members, representing 3,908 or 15 per cent of the total, performed an excision and primary closure in over 20 per cent of their cases and some type of an open operation in the remainder.

Kleckner reported in 1936 that 87 per cent of the members of this Society preferred an open method of treatment of pilonidal sinus disease, 7.5 per cent a primary closure and 5.5 per cent were using both technics. Rosser, in 1947, found that 77 per cent of the surgeons he contacted favored an open operation and 18.5 per cent a closed procedure.

In 1952 we found that 70 per cent of our members, representing 17,536 patients, were treating this disease with some type of an open operation and 30 per cent, representing 7,784 cases, were utilizing a closed method in selected cases. (Table II.)

We believe that this present survey of the American Proctologic Society, as compared with previously reported experiences, demonstrates a very definite trend in the treatment of this condition. It would seem obvious that the consensus of this Society at the present time is that there is no single operation or technic that can be adopted for all pilonidal surgery. The ideal treatment must be suited to the patient and to the local condition. It is apparent, however, not only from the statistics presented but also from the many valuable individual comments which were made on the questionnaires that in the treatment of pilonidal sinus disease the tendency at the present time is to avoid massive block excisions with their excessive removal of healthy tissue. Such a procedure often results in prolonged healing time, disability and, frequently, disfiguring and painful scars.

One of the common pitfalls, and one which many, particularly those who have not had a special interest in this condition, have failed to appreciate, is that the treatment of a pilonidal sinus is not a minor surgical procedure. Sufficient attention has not been given to basic surgical principles in its treatment. When one appreciates the frequency with which this disease occurs and the economic factors involved, as expressed in the number of days lost,[10,11] not only from military service but also from civilian occupations, it can be appreciated that the definitive treatment of pilonidal sinus disease is far from an insignificant surgical problem.

The causes of failure in the healing of these wounds and the high incidence of recurrence following definitive treatment have not been adequately appreciated. When a closed technic is employed, pilonidal sinus wounds fail to heal or break down following primary healing because of failure to eliminate dead space, prevent the introduction of infection, preserve an adequate blood supply to the area, close such wounds without tension, avoid trauma and to maintain the part at rest during the period of healing. In the open methods the prevention of bridging over of the wound, the formation of excessive granulation tissue and of the introduction of infection are of the utmost importance.[2] Pilonidal sinus disease is found in a region of the body most difficult to sterilize and to keep free from moisture and bowel contamination. It is an area with a notoriously poor blood supply and is subject to repeated trauma by the mere act of sitting or walking. These factors are particularly important in the obese or hairy individual in whom pilonidal sinus disease so frequently occurs.

It has been rare among the high percentage of cases (25 per cent) referred to us because of recurrence of pilonidal sinus disease to find any evidence of the original process.[27] We frequently find hair and other debris in these wounds; but in the majority of the cases it is due to an invagination of ectodermal tissue[10,11] and the result of inadequate surgery at the time of operation or, more frequently, to improper aftercare. It is our contention that the area of a pilonidal sinus wound can be sterilized and kept relatively dry, clean and free from infection; and that the blood supply will be ade-

quate for prompt healing if minimal amounts of tissue are removed, dead spaces are eliminated and if the area is immobilized, kept free from invaginated hair follicles and protected from trauma during the immediate postoperative period. If these principles are adhered to, the incidence of failure to heal or recurrence following any of the open or closed methods of treatment of pilonidal sinus disease will be minimal.

TREATMENT

There can be no question as to the necessity for immediate incision and drainage of the pilonidal cyst or sinus with an acute abscess. It is important, however, in planning this incision and drainage not only to plan the incision so that adequate drainage is obtained but also to consider the method of definitive treatment which will be employed later. A few of our members mentioned an immediate block excision of an inflamed mass, allowing the wound to granulate secondarily. It is true that the necessity for a second operation is thus eliminated but the importance of not removing excessive amounts of tissue with resulting mutilating scars was repeatedly emphasized in the answers to our questionnaires.

For the patient with the type of pilonidal sinus disease usually presented, one or more draining sinuses without evidence of acute infection, the majority of our members prefer some type of an open operation. The largest group prefers simple excision, allowing the wound to granulate in secondarily. A second group, almost as large, emphasizes a limited excision, a simple unroofing with the postoperative use of cauterizing agents, the curetting of the wound with dry gauze or a partial closure. A third group, also nearly as large as the others in number of patients treated, employs the marsupialization technic. In this procedure the base of the sinus tract is left intact and the skin edges are sutured to this residual scar tissue. There were other special technics[3,4,11,25] advocated by a few of our members. The method of Rogers (cautery excision) is mentioned. Injections of silver nitrate crystals and of other sclerosing agents find favor with a few.

Considerable discussion was contained in the answers to our questionnaire on the various technics which have been proposed for the excision of pilonidal sinuses followed by immediate primary closure. The two methods most commonly being utilized are those following the sliding musculofascial graft method advocated by Shute[29] and others,[13,30] and the method advocated by Pope[24] and others;[12] the two methods are about equal in popularity. Simple excision with primary closure without some type of sliding musculofascial graft has not been popular with our members. At the clinic, also, we have had an unsatisfactory experience with this method. (Table III.) In the Shute method parallel incisions are carried down through the fascia overlying the gluteal muscles lateral to the edge of the lower sacrum and coccyx and into the body of the muscle for 1 cm. or more, turning both flaps medially and uniting them in the midline with absorbable suture material. This method aids in the elimination of dead space and provides a pad of tissue between the skin and bone. In the Pope technic, of which we have employed a modification, the musculofascial attachments of the gluteals to the lower sacrum and coccyx are divided, the incision is carried out into the body of the muscle on both sides and the mobilized fascia and muscle are united in the midline with absorbable suture material. This also eliminates dead space and provides a pad of tissue between the skin and the coccyx and lower sacrum. Although it has not been emphasized in the answers to our questionnaire, it has been our experience that discomfort and, on occasion, actual pain have been frequent complaints of many patients years after an operation which leaves an extensive, adherent scar over the sacrum and coccyx. (Figs. 1 to 4.)

TABLE III
TREATMENT OF PILONIDAL SINUS DISEASE
(Lahey Clinic, 1946–1952)

Group	Operation	Cases	Recurrences	Per cent
1	Excision only (postoperative cauterization)	11	2	18
2	Marsupialization	15	1	6.6
3	Excision—simple primary closure	25	8	32
4	Excision—primary closure (modified Pope technic)	72	14	19
	Total	123	25	....
5	Previous definitive surgery	31	..	25

The most desirable method of treating the recurrence of pilonidal sinus disease following definitive surgery is a much more difficult and complicated problem to discuss. Almost with-

out exception it was stated in the answers to our questionnaire that the treatment of recurrent disease should be limited to an excision of all diseased tissue, allowing the wounds to granulate secondarily, although those advocates of the marsupialization technic in many instances stated that they would repeat a marsupialization procedure.

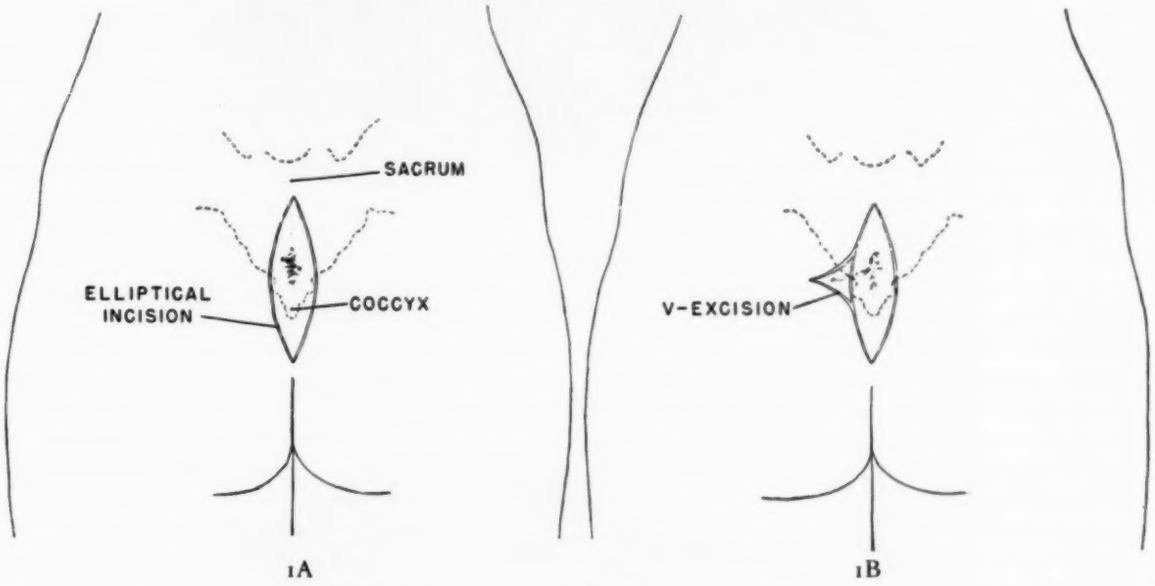


FIG. 1. A, a narrow, elliptic incision is made, excising all diseased tissue. A minimum amount of skin is removed and the incision is carried down deep enough to excise all pathologic tissue. B, lateral openings in the sinus tracts are excised with V-shaped excisions and primarily closed as indicated.

The statement was repeatedly made that excision with primary closure was the ideal procedure for the treatment of pilonidal sinus disease, but many of our members were unwilling to treat the majority of their patients in this manner because of the recognized high incidence of recurrence. It is our contention, based not only on our personal experience but also on the trend demonstrated in the replies to this questionnaire, that with a consideration of the definitive treatment of pilonidal sinus disease as a major surgical procedure and with experience and meticulous surgical technic before, during and after operation more and more of our patients can be operated upon by the closed method with end results which will be superior to those obtained by any of the open methods of treatment.

Certain other information of interest was obtained from the answers to our questionnaire. The incidence of recurrence at the present time reported by those who advocate the open procedures is very low; many reported no recurrence. Other reported incidences varied from 1 to 10 per cent. We are certain that many of these were not actual recurrences but failure of wound healing due to factors previously mentioned, and are errors in surgical technic.

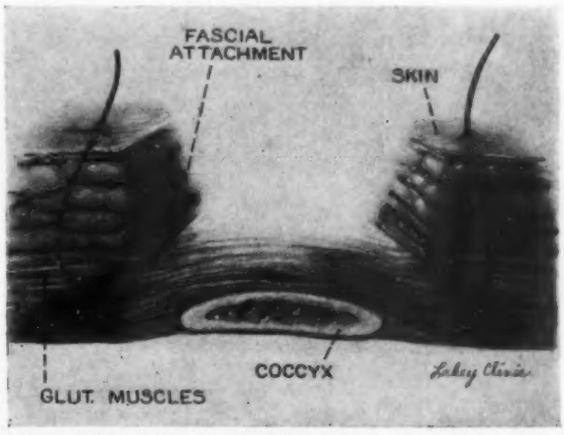
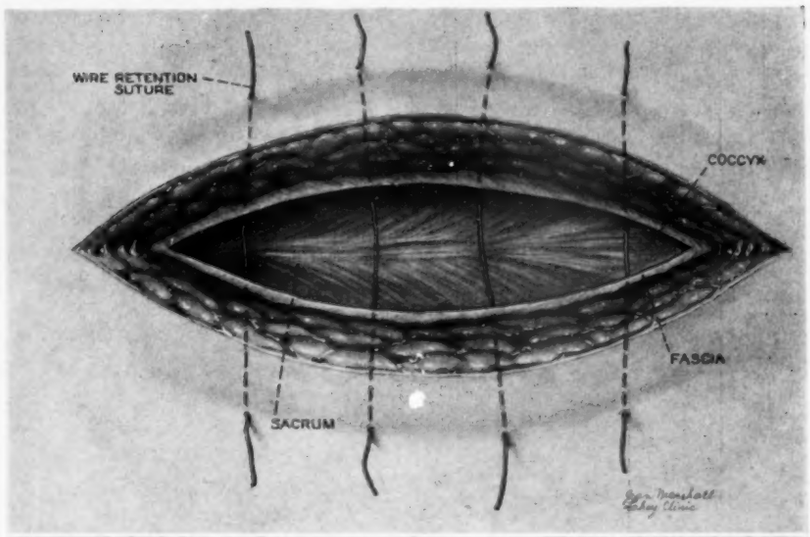


FIG. 2. The fascial attachments to the coccyx and lower sacrum are incised into the body of the gluteal muscles. This allows the fascial attachments to be united in the midline with absorbable catgut sutures without tension.

Also, among the advocates of the marsupialization method the incidence of recurrence was reported as very low, many reporting none, although several reported incidences of 2, 5 and 10 per cent.



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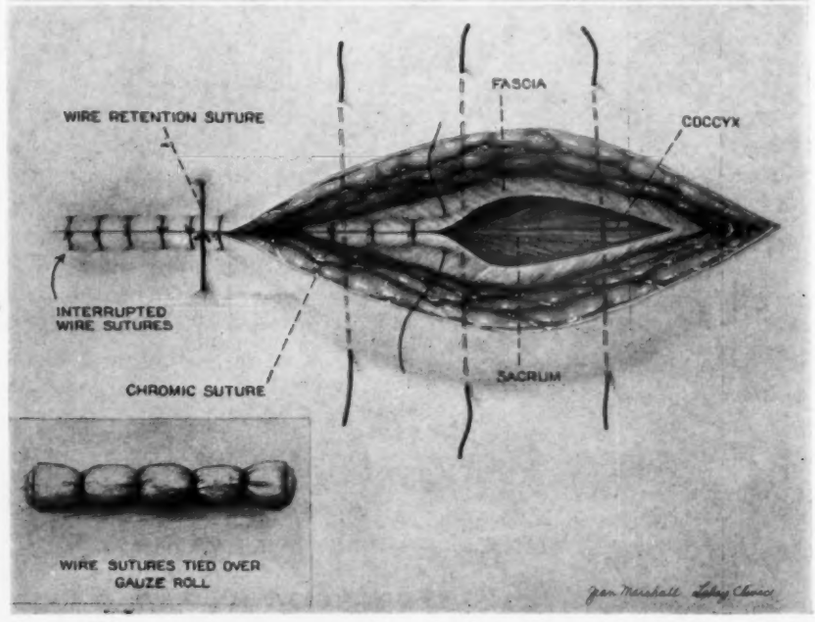

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FIG. 3. Wire retention sutures are shown in place; they are carried through the gluteal fascial attachments but not into presacral fascia.

FIG. 4. Method of closure of wound is shown. Fine, interrupted, catgut sutures unite the fascial attachments in the midline without tension. This helps materially in obliterating dead space and provides a pad of tissue between skin and bone. The skin edges are very carefully everted and closed with fine wire mattress sutures. The use of a gauze roll held in place by the wire retention sutures aids materially in keeping the wound clean following operation and provides additional pressure to the wound area. A thick gauze dressing with buttocks carefully strapped is placed over the wound and not removed for seven to eight days.

Among those advocating excision and primary closure in selected cases, the incidence of recurrence was not nearly as high as has commonly been reported in the past. In this group incidences of recurrence varied from 2 to 20 per cent, the average being 5 to 7 per cent. It was interesting to note, however, in the answers to the questionnaire that among the group who were doing closed operations in selected cases, the incidence of recurrence quoted following open operations was higher than in the group who favored the open procedure alone. It is

most important in considering statistics on the incidence of recurrence following surgery for pilonidal sinus disease to consider the question of definition, that is, actual recurrences or simple failure to heal.

With regard to the question of preliminary drainage there was general agreement that this should be done in acute processes. There was some disagreement on the length of time that should elapse between preliminary drainage and the secondary procedure, some stating that this interval should be at least six months. In general, however, the time interval between incision and drainage and definitive surgery was shorter.

Concerning the questions of ambulatory treatment, hospitalization and time out of work, the figures were consistent. Almost none of our members suggested that these procedures should be done outside a hospital. For incision and drainage one to two days of hospitalization was considered adequate. When excision only was performed, the average period of hospitalization ranged from three to ten days in various groups and, almost consistently, ten to twelve days were necessary when closed technics were employed. With the open procedures the time out of work varied in the answers to the questionnaire; the figures given were from seven to thirty days, with the majority reporting twelve to fourteen days. With the closed procedures there was closer agreement; the time out of work averaged three weeks.

Unfortunately, one important question was unintentionally omitted from this questionnaire and that was the healing time of these wounds. However, based on the questionnaires on which this information was inserted, plus our own experience, the healing time when primary closure procedures were utilized was ten to fourteen days and that of the open operations varied in some of the reports of those who employed marsupialization from three or four weeks to six or eight weeks as an average, although we all recognize that there are occasional cases in this category, usually when aftercare has been neglected, in which many months are necessary for complete healing.

RESULTS

The results obtained in 123 patients with pilonidal sinus disease treated at the Lahey Clinic between 1946 and 1952 are tabulated in Table III. The operations were performed by seven different surgeons, although in Group 3 in which a sliding musculofascial graft technic was employed the operations were performed by one surgeon. We are not satisfied with these results. In Group 1 the cautery excision method advocated by Rogers[27] was chiefly performed. This method has proved satisfactory although healing time is prolonged and it is not satisfactory for patients who come to the clinic from a distance. The fifteen patients in Group 2 were treated by a marsupialization technic. The results were satisfactory except for the prolonged healing time.

The incidence of recurrence when excision and simple closure was done is too high to be satisfactory (32 per cent).

The recurrence rate (19 per cent) following the employment of a modified Pope technic using a sliding musculofascial graft was not as unsatisfactory as the figures indicate. It has been our experience and was repeatedly emphasized in the answers to our questionnaires that stainless steel sutures are desirable when closed technics are employed. There were five recurrences in this group which were caused by the breakage of the steel sutures at the time of their removal. This technical error has now been corrected and should not occur in the future. Complete healing of these wounds was delayed very little. Two recurrences were due to errors in technic. Sepsis resulted and it was necessary to reopen the wounds and allow them to granulate secondarily. A group of seven cases of recurrence or delayed healing due to invaginated hair presents a problem. We believe, however, that with meticulous postoperative care, particularly the frequent shaving of the area, and the exact approximation of wound edges at the time of operation, this incidence of failure of the wounds to heal can be further reduced. Actually, in this entire series there were only three patients who required secondary operations.

At the present time our attitude at the clinic is to continue this method, that is, a modified Pope technic, for selected cases. This will represent a majority of the patients treated. It must be remembered in this connection that many of our patients at the clinic come from a distance. We have never been satisfied with the postoperative care of these patients when it has been necessary to turn over this responsibility to another physician. In our patients treated by excision and primary closure, when

there was any degree of infection present, a preliminary incision and drainage was performed.

In our personal experience there has also been an important economic factor in this problem. We have found that increasing numbers of patients, particularly those who come to the clinic from a distance but also many others, are willing to spend ten to fourteen days in a hospital, which is required with the closed technic, with a reasonable chance of not having to make the frequent postoperative office visits for dressings and the detailed after-care which is so very important in the prompt healing of open wounds.

We have differed in one other policy with the attitude expressed in the answers to our questionnaire and that has been in the treatment of postoperative pilonidal sinus wounds that have failed to heal for long periods of time or when we believe there may be an actual recurrence of the disease. These wounds afford a real challenge to one's surgical skill and we have frequently excised and primarily closed these wounds with resulting minimal scar and a minimal delay in the return of these patients to their usual occupations.

SUMMARY AND CONCLUSIONS

1. A questionnaire on the present status of treatment of pilonidal sinus disease was sent to the members of the American Proctologic Society and the results are tabulated. Replies were received from 248 of the 481 members, representing 25,320 patients.

2. This survey reveals that at the present time there is no single technic that should be adopted for all pilonidal surgery. A pilonidal sinus operation should be designed for the individual and for the pathologic condition present.

3. A comparison of the results of this survey with previous reported experiences of members of this Society shows a definite trend away from massive block excisions and toward limited excisions, partial closure or the marsupialization of these wounds. The comparison indicates also that for experienced surgeons the end results of excision and primary closure of pilonidal sinus disease are satisfactory in an increasing number of selected cases.

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DISCUSSION

Karl Zimmerman (Pittsburgh, Pa.): Drs. Swinton and Markee have compiled the most extensive statistics on pilonidal disease that can be found in the literature. Their survey is the most comprehensive since that of Dr. Kleckner in 1936. The figures are well analyzed and the most obvious conclusions are made. There is one trend indicated by these figures that has been noted by the authors but has not been emphasized.

In Dr. Kleckner's paper such operations as unroofing and marsupialization of pilonidal cysts is not mentioned. Other literature of the same period does not mention this type of operation. Now, eighteen years later, we find that 10,910 of 25,320 cases, or more than one-third, are being done by these methods. It would seem that this is an even more pronounced trend than that shown by the increase in closed operations.

Unroofing or marsupializing technics are based on the principle that pilonidal cysts will heal even though all their lining is not removed. This is contrary to what has been taught and written for years and, therefore, is difficult to accept. Nevertheless it is true. In order to prove this point I have taken pictures of pilonidal wounds healing. The operation in each case consisted of passing a probe into each cyst or sinus tract, dividing the overlying tissue with a scalpel and wiping the dirt out of the tracts with a piece of gauze. Pictures were taken of the wounds as they healed after the operation and show that healing will occur without the lining being removed.

Victor C. Tucker (San Antonio, Texas): Pilonidal sinuses constitute one of the most difficult problems in military surgery. I believe most of the Armed Forces are now back to the practice of only incising and draining acute pilonidal sinuses abscesses without much attempt at curative surgery, except in this first stage operation.

It is difficult to evaluate results of pilonidal sinus surgery in the military services, as one surgeon cannot follow one patient for months or years, as is possible in private practice. However, for several years the over-all results of the excision and primary suture were good at the Brooke Army Medical Center in spite of the multiplicity of operators and minor variations in technic. The technic generally followed was that described by Lt. Col. Bernard B. Larsen in *Annals of Surgery*, for June, 1946. The tendency was to be a little less radical than the described technic.

This technic is a block dissection with simple closure in layers of buried sutures, forming a thick pad over the operative area. Another very interesting summary of this subject will be published soon by Capt. James A Denning, of Lockland Air Force Base.

In pilonidal wounds treated by the open methods or in sutured wounds that have had to be reopened, we are all familiar with the astounding results in healing often seen following the proper use of varidase.® The Lederle Company has now come out with a jelly vehicle for varidase that may make it easier to apply, as well as more stable and less expensive to use. The antibiotic ointments and creams have been generally disappointing in their results in promotion of healing.

I discussed this paper mainly to bring to your attention a useful trick commonly used in Armed Forces hospitals but apparently little used as yet in private hospitals. This cheap and simple method of promotion of healing in dirty open wounds is the washing of the wound with cotton applicators dipped in liquid G-11 soap, in this case septisol.® Dirty, infected, foul-smelling wounds full of unhealthy excess granulations rapidly become clean, healing wounds with this convenient and inexpensive care.

One of my cases, a poor laborer, living in primitive circumstances in a distant farming community, had had what was apparently a very large block dissection with no attempt at suture in April, 1951. I saw him in April, 1952, and had him use antibiotic ointments and creams, with little success. Four months ago his wound was still large and full of foul pus and excess granulations. I started him on the

daily use of G-11 soap applied deep with cotton applicators. His wound is now clean and almost completely healed. For the first time in over two years he is able to work; and if healing is not soon complete, he will at least be in condition for further surgery because of the G-11 soap.

MARTIN S. KLECKNER (Allentown, Pa.): Naturally, Dr. Swinton has given us a better model and presentation of things than we have had since 1936. At that time we knew nothing about marsupialization. That was introduced by Ed Martin, I believe, about fifteen years ago. At the time that these cases were presented we asked the men what technics they used and found that we had recurrences in 22 per cent of the cases in which the wound was closed, either by suture or by suture and partial drainage. However, in the wounds that were left open and permitted to heal by third intention, recurrence occurred in only 1 to 1½ per cent.

I admire the men who will proceed to suture such wounds. I think in some of these cases it is applicable, depending on the size of the pilonidal sinus and the extent of the excision. I, personally, believe in excision; not, however, wide excision. All the sinuses should be removed and, of course, if a good result is desired it must be realized that proper postoperative care and elimination of all dead space are necessary.

The method that I have used, which I would like to present to you, is as follows: the first step is to put probes into the different sinuses and then open them up, thus getting to the bottom of the so-called cyst. Then we excise all the sinuses by means of the electric or Bovie knife because we like that best. All hemorrhage is controlled by electrocoagulation. This leaves an open, and sometimes wide, wound. In order to obtain good approximation we may do some undercutting, but we are very careful that all the hemorrhage is controlled, because that is extremely important.

After gauze has been dropped lightly into the wound, a broad band of adhesive is drawn across from one side of the wound to the other, almost approximating the edges. Sometimes we put in sulfanilamide powder or tincture of merthiolate on gauze and the wound is then brought together with a broad band of adhesive which is 2 or 3 inches in width. It is kept in position for three days during which time the bowels move by themselves or by enema. If the patient should have any trouble, we give him a low enema but, as is the rule, the introduction of the rectal tube is sufficient.

At the end of three days the patient has the initial dressing removed down to that portion directly on the wound. The patient is allowed in the tub for about five minutes and then we dress the wound after cutting the first adhesive band. This adhesive has helped to hold the tissues and they heal in the position into which they have been drawn. The patient is told (about the third day) to introduce an ounce of $\frac{1}{8000}$ bichloride mercury solution into the top of the wound. This keeps the dressing wet and also keeps the wound clean so that there is very little pus present.

At the end of another three days the patient again has a tub bath and a redressing, putting another band of adhesive over the wound and right over the remaining adhesive.

The patient remains in the hospital from seven to ten days. We supervise all these patients ourselves. Dr. Swinton remarked that the trouble occurs when we hand these patients over to the general practitioner, especially when they come from a distance; this is very true. I think every operator should insist that these patients come back periodically for rechecking.

We rarely have them come from distances of 400 miles or more which may alter the situation entirely. However, I do not believe that many of these infected wounds, such as infected pilonidal sinuses even though they are not too extensive, can be brought together very well by suture without running a chance of recurrence, particularly when they pass out of our hands.

We have not had any recurrences. In an open wound, being sure of your infection, trying to keep dead space limited and not disturbing the wound so that it will heal, you have your best chance of cure.

G. M. BROWN (Bay City, Mich.): I should like to add one more word about the treatment of the pilonidal cyst abscess. The first time such a patient is seen, he comes to you complaining of inflammation and pain to the extent that he cannot sit. For the past several years I have been sending these patients to the hospital and treating them as emergency cases, operating upon them the same day, using a spinal anesthetic and doing a block removal of the inflamed area. At the same time, I

cauterize the lesion as I would in a chronic case that I did not want to close. This procedure prevents the necessity of a second operation. The patient is treated by sitz baths for two or three days and is out of the hospital in another two to three days. The sitz baths continue at home. The patient is permitted back to work in two weeks and needs no further surgery. As yet I have had no trouble with any of these cases. Penicillin and streptomycin are administered while the patient is in the hospital, but not after discharge.

NEIL W. SWINTON (closing): I am very appreciative of the comments and additional suggestions that have been made on this subject. I would like to add one other thing. One of the pleasantest jobs—and it was a lot of work—that I have done in a long time was to go over the more than 240 questionnaires that were sent back to me. It was a great pleasure and I appreciated it. I was not able to acknowledge many of the personal notes that were sent along, but it made me very proud to be a member of this organization. I appreciate the cooperation and hope that this has contributed a little to our knowledge of the subject.

SIGNIFICANCE OF URETERAL STUDIES IN COLONIC AND RECTAL SURGERY*

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ANATOMIC relations of the ureters may be altered significantly by specific disease processes and by previous surgery affecting the colon and rectum. These altered relations of the ureter may be more readily seen by preoperative x-rays showing catheters which have been introduced into the ureters. Frequently the surgical management of colonic and rectal lesions may be improved by information indicating the possible need for a more radical approach than could otherwise be anticipated in the absence of studies demonstrating abnormal changes in the anatomy of the urinary tract.

Increased attention is being given by the colonic surgeon to this important problem as the result of recent contributions by Spillane, Kaiser and Prather[1] and by Krause and Lubert,[2] who recommend urography as an adjunct to the management of carcinoma of the large bowel. It has been demonstrated by these workers that pyelograms are of value in colonic surgery. Pressure upon the ureters from carcinomatous involvement of iliac structures and ileopelvic lymph nodes, as well as abnormal reperitonealization of the pelvic floor comprise major factors causing ureteral deviation. As a result of ureteral deviation, in some instances, serious and frequently fatal complications of renal damage may be encountered.

Normally the left ureter is initially found during mobilization of the sigmoid colon, in its retroperitoneal, infracolic position, posterior and slightly lateral to the curve of the sigmoid colon, being crossed anteriorly in the male by the spermatic vessels or by the ovarian vessels in the female and by the left colic and sigmoidal vessels in many instances. This point of initial isolation of the ureter may be identified in approximately one-half of cases by the intersigmoid fossa of the peritoneum. The left ureter then normally courses over the psoas major muscle in its anterolateral approach to the vesical trigone, crossing the iliac vessels at the pelvic brim, usually at or near the iliac bifurcation. On the right side the ureter is identified more readily, normally descending several centimeters lateral to the aortic axis and following a course contralaterally similar, although not identical, to that seen on the left. These familiar anatomic findings are manifest radiologically in the normal retrograde pyelograms conveniently done at the time of cystoscopic survey prior to lower bowel surgery. The symmetrically descending curves of the right and left ureters are seen usually within 1 or 2 cm. lateral to the transverse processes of the lumbar vertebrae, descending in the midalar region of the sacrum to converge toward the trigonal area. Minor variations of pattern may occur within the range of normal.

Disturbance of normal anatomic position of the ureters with resultant asymmetry and deviated position may be reflected in altered contour or ureteropyelograms. Retrograde pyelograms are believed preferable in this situation to intravenous pyelograms because of greater incidence of visualization than may be obtained with uncertain dye excretion studies. With preoperative cystoscopic survey it is usually convenient to obtain x-rays with the ureteral catheters in place.

It is the purpose of this study to present information obtained from ureteral x-rays as an adjunct to surgical management of eighty-six patients on the Proctologic Service at Temple University Hospital. These patients ranged between the ages of thirty-one and seventy-six years, the average being 53.9 years of age. Of this series of eighty-six patients, forty-two (48.8 per cent) were males while forty-four (51.2 per cent) were females. Indications for

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surgery included the following: Carcinoma of the distal bowel constituted the largest group, sixty-six patients (76.5 per cent); diverticulitis, seven patients (8.1 per cent); adenomatous polyps above the peritoneal reflection, six patients (6.9 per cent); chronic ulcerative colitis, five patients (5.8 per cent); rectal stricture due to lymphogranuloma venereum, one patient, and radiation proctitis, one patient (1.2 per cent). The types of surgical procedures included Miles' abdominoperineal excision of rectum with abdominal colostomy, abdominoperineal proctosigmoidectomy with sphincter preservation, anterior resection of the rectum, sigmoidectomy, colectomy with synchronous ileostomy, and abdominal colotomy with polypectomy, depending upon the diagnosis in each instance. Because of the purpose of the study the findings and discussion will be confined to the subject of ureteral studies and their significance.

RESULTS

From the study of eighty-six patients the following results were obtained: Anatomic position of the ureters, so far as could be determined by x-ray, was bilaterally normal as to course and symmetry in fifty of the eighty-six patients, or 58.1 per cent of the series. This was confirmed by operative findings. Thus the largest group, over half of the series, demonstrated undeviated ureteral position. This includes two patients in whom discovery of double ureter was made (2.3 per cent of the series); one patient had double left ureter while the other patient had double right ureter, detected as a result of this study. However, the course of the ureters was undeviated.

It was found that in fourteen of the eighty-six patients (16.4 per cent) the ureters were unilaterally demonstrated as normal because of failure to catheterize both ureters. In nine patients (10.5 per cent) the right ureter could not be completely catheterized while in five patients (5.8 per cent) the left ureter could not be completely catheterized. However, failure to catheterize a ureter in this group was actually correlated with a demonstrable pathologic condition in only two of the fourteen patients in whom bilateral catheterization was unsuccessful; in one patient the right ureter was deflected medially by adhesions involving the rectosigmoid while in the other patient the left ureter was deflected medially by a sigmoidal lesion. Failure of bilateral ureteral catheterization in the majority of patients in this group was attributed to causes, either functional or organic, not directly referable to the primary disease of the bowel. However, in these two instances of ureteral deflection the catheter could not be introduced into the correspondingly affected ureter prior to surgery. It was possible to disassociate the ureter without injury to the structure and without sacrifice of radicality in extirpation of the primary lesion involving the bowel. Sacrifice of the ureter, however, is an ever present possibility in adequate pelvic surgery, and knowledge of involvement in these two instances had suggested the possibility that ureteral excision might have been required.

Of the eighty-six patients, twenty-two (25.6 per cent) were found to have ureteral deviation as determined by bilaterally successful catheterization prior to surgery. This group demonstrating abnormality upon bilateral catheterization may be subdivided as follows: deviation of the right ureter was found to be medial in seven patients (8.1 per cent) while right lateral deviation was found in three patients (3.5 per cent). Left medial deviation was present in ten patients (11.7 per cent) while left lateral deviation was present in two patients (2.3 per cent). Thus the largest group showing deviation was in the medial deviation of the left ureter, demonstrable in 11.7 per cent of the series.

In contrast to the low correlation found io that group demonstrating unilateral failure of visualization, correlation between preoperative findings and findings at operation was high in the group of twenty-two patients demonstrating asymmetric ureters; ten (45.4 per cent) of those with x-ray indication of ureteral abnormality to bilateral catheterization showed abnormal anatomic relations of the ureter associated with intracolonic disease, as proven at surgery. One patient demonstrating left medial deviation had undergone previous surgery, and the ureteral deviation toward the midline was found to be the result of previous reconstruction of the pelvic floor. (Fig. 1.) Two patients demonstrating preoperative medial deviation of the right ureter were found at surgical exploration to have advanced extracolonic extension of primary cancer of the bowel, compatible only with palliative surgery. (Fig. 2.) One patient demonstrating preopera-

1 2

FIG. 1. Ureterogram showing medial deviation of the left ureter.

FIG. 2. Ureterogram showing medial deviation of right ureter. Incidental finding of osteoblastic metastases noted in right bony pelvis.

tive left medial deviation was found to have similarly advanced extracolonic extension of bowel carcinoma of such extent to permit only palliative surgery, notwithstanding previous good results obtained by extensive exenteration procedures in the presence of suitable indications. Another patient with preoperatively demonstrable ureteral deviation was found to be inoperable, with findings of such extent as to be incompatible with either palliative colostomy or any palliative resection. Another patient with preoperatively demonstrable left medial deviation was found to have operable, potentially eradicable carcinoma of the rectosigmoid and an incidental sclerosing lipoid granuloma of the left spermatic cord, subsequently resected and diagnosed by pathologic study.

Thus, in résumé, it was found that twenty-two of the eighty-six patients studied, (25.6 per cent) showed asymmetric ureters. Of this number, ten showed significant ureteral involvement at time of surgery, representing 11.7 per cent of the series; seven of these patients had left medial deviation (8.1 per cent) and three had right medial deviation (3.5 per cent). Of these ten patients it was found that five had associated pathologic disease classifying the patient as probably incurable (e.g., liver metastases, peritoneal seeding or serosal seeding of multiple areas) at the time of surgery; the remaining five underwent surgery of sufficient extent as to be attended with the expectation of complete eradication of the disease.

COMMENTS

Of eighty-six patients having preoperative x-ray studies to determine asymmetry and possibly disturbed anatomic relations of the ureters, fifty patients (58.1 per cent) were found to have normally placed and normally symmetric ureters. This was confirmed by operative findings. However, it must be recognized that abnormal anatomic position of the ureters may be encountered despite "normal" preoperative studies and that contiguous involvement of the ureters may occur from an adjacent intracolonic process without causing demonstrable ureteral deviation in the exceptional case. In fourteen patients (16.4 per cent) pre-operative x-ray studies of the ureter indicated unilateral normality only; or conversely, it was intimated that there might be unilateral abnormality in 16.4 per cent. It is appreciated,

however, that failure to introduce catheters bilaterally may be referable to factors other than actual organic disease either of the urinary tract or of the large bowel. Thus a low correlation was found in that group with unilateral failure of visualization of one ureter, although it was found at operation that two of the fourteen patients in this group had ureters deflected as a result of pathologic disease of the bowel.

In the group of twenty-two patients (25.6 per cent) having asymmetric and abnormal ureters on preoperative x-ray studies a correlation was made in 45.4 per cent of these, for ten of the twenty-two patients showed the ureteral abnormality anticipated prior to surgery. Medial deviation of either the right or left ureter was present in the largest group of these patients, rather than lateral deviation; seventeen of the twenty-two patients (19.7 per cent) showed medial deviation as compared to five of the twenty-two patients (5.8 per cent) showing lateral deviation. Of the seventeen patients demonstrating medial deviation, ten patients (11.7 per cent) were found at operation to have anatomically disturbed ureters, deflected medially, and associated with profound pathologic changes of the lower colon and rectum; five of these (5.8 per cent) showed extensive extracolonic invasion complicating primary carcinoma of the bowel, while five patients had ostensibly intracolonic carcinoma. Spillane, Kaiser and Prather[1] have advocated the term "medial deviation" of the ureter for use in reference to the postsurgical deformity, while "medial fixation" might be employed to designate deformity of the ureter secondary to carcinomatous involvement. Regardless of terminology or of the method used in preoperative evaluation of ureteral position, the possibility of altered anatomic position of the ureters is ever present in colonic and rectal surgery.

CONCLUSIONS

1. Preoperative retrograde ureterograms were studied in a series of eighty-six patients undergoing surgery for lesions of the colon and rectum.

2. In fifty of the eighty-six patients (58.1 per cent) the ureters were bilaterally normal as to position, course and symmetry.

3. In fourteen patients (16.4 per cent) failure of visualization of one ureter following attempted bilateral catheterization indicated a possible unilateral abnormality which in two patients (2.3 per cent) was correlated with actual disease.

4. In twenty-two patients (25.6 per cent) asymmetry or deviation of the ureter was indicated by bilaterally successful ureteral catheterization preoperatively, and which in ten patients (11.7 per cent) was correlated with actual pathologic disease at time of surgery.

5. Medial deviation, deflection or fixation of the ureters may occur due to carcinomatous, inflammatory or surgically induced changes in the abdominopelvic region.

6. Medial deviation of the ureters, as demonstrated in preoperative x-ray study, is frequently associated with serious pathologic changes and may, as well, indicate an unfavorable prognostic sign of extensive intra- and extracolonic disease.

7. It is believed that routine preoperative pyelograms and ureteral studies are a valuable adjunct to the improved surgical management of colonic and rectal lesions.

Acknowledgment: We wish to thank Lowrain E. McCrea, M.D., Chief of the Department of Urology, Temple University School of Medicine, for cooperation in this study.

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DISCUSSION

George H. Ewell (Madison, Wis.): It has been a pleasure to read and hear this paper presented. The authors are to be commended for again calling to our attention the importance of the relation of the urinary tract to diseases of and operations upon the intestinal tract and anorectal surgery.

In a previous communication on the causes and management of vesical dysfunction following abdominoperineal rectosigmoidectomy and other operations on the left colon I stated that in our clinic* infections of the urinary tract and retention of urine were the most consistent and most troublesome complications of the operation. In approximately 10 to 15 per cent of all patients who undergo an abdomino-

* Jackson Clinic, Madison, Wis.

perineal operation a serious complication will develop in the urinary tract. Such complications may respond readily to treatment or may cause prolonged disability, and major surgical procedures may be required for their correction.

I am in complete accord with the authors' recommendation of urography as an adjunct to the management of carcinoma of the large bowel or cases in which patients with diverticulitis are undergoing surgery. In most of these cases a satisfactory demonstration of the kidneys and ureters may be obtained by excretory pyelography. In others cystoscopy and ureteral catheterization is required. In some elderly men ureteral catheterization is not always possible due to anatomic distortion of the intramural portion of the ureter secondary in most instances to prostatic hypertrophy.

Those surgeons who do abdominoperineal and related surgery are to be congratulated on the low incidence of ureteral injuries. As the authors point out, the surgeon in most instances is careful to identify the left ureter, but he should bear in mind that injury to the right ureter occurs in a fair number of cases. It is incumbent on him to identify both ureters.

The authors indicate that knowledge of a double or duplicated ureter, as demonstrated preoperatively in two of their fifty-one cases, is of distinct aid at the time of surgery. They emphasize the importance of deviation of either ureter from its normal course as being highly suggestive of changes secondary to the disease for which the bowel surgery is being performed. Ureteral reduplication or double ureter is common. These ureters are prone to develop pathologic changes largely due to obstruction from diseases in or outside the urinary tract.

The reduplication may be complete or incomplete. The duplication is complete in about one-fourth of the cases and may be unilateral or bilateral. Campbell reports that while bilateral reduplication occurred but twice in 480 autopsies in infants and children, he had observed it clinically in fourteen children.

In those cases of incomplete reduplication the bifurcation occurs in the lower third of the ureter in about half of the cases; the remainder is about equally divided between the middle and upper third. Approximately 75 per cent then occur in the region where the ureters would most likely be injured during operations on the sigmoid and during abdominoperineal operations.

Another urinary tract anomaly which should be referred to is dystopea or abdominal location of one or both kidneys. In this connection we are chiefly concerned with pelvic ectopic kidneys. This anomaly has been found on the average of once in 800 autopsies, yet among cases of surgical renal disease the incidence of ectopic kidney is much greater. It is said to be more common in women and definitely more common on the left side.

Unilateral renal agenesis or congenital solitary kidney occurs with such frequency as to warrant serious clinical consideration so far as renal disease is concerned, and this anomaly must always be borne in mind when injuries to the urinary tract occur. This anomaly has been found in a ratio of 1:600 in an autopsy series of patients of all ages. The occurrence is approximately equal on both sides and in both sexes.

Some cases of ureteral injury may occur as a result of disturbances of its blood supply. Anatomic studies have demonstrated that its blood supply is derived from one or more large arteries that arise from the distal abdominal aorta, the common iliac or internal iliac arteries. In the pelvis the most constant supplies are the arterial branches from the uterine, vesical and middle hemorrhoidal arteries.

The vascular supply to the ureter in its middle third is from the medial side of the abdomen; therefore any retroperitoneal incision must be done lateral to the ureter. In the pelvic portion of the ureter the vascular supply is from the lateral side and a medial incision in the peritoneum is advisable.

The surgeon may find it necessary to do an extensive dissection in some cases of malignancy or it may be difficult to mobilize the sigmoid in those cases in which recurrent episodes of diverticulitis have occurred followed by a marked inflammatory reaction. Necrosis of the ureter may then occur from disturbances of the blood supply to the ureter and not due to mechanical injury of the ureter.

May I again call your attention to the fact that complications in the urinary tract may be the most frequent and troublesome ones following operations on the left colon. The authors in their paper have pointed out that some of the most serious complications may be avoided by having these patients undergo urologic survey prior to operations on the left colon.

POLYPS OF THE RECTUM AND COLON IN CHILDREN

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IN this article the subject of polyps in children will be limited to the sessile or pedunculated tumors of glandular origin. The familial type of polyposis or submucosal growths which prolapse and appear as polyps or pseudopolyps is not included.

The incidence of polyps in children twelve years of age or younger is not known. Helwig[4] did postmortem examinations on 369 children ten years of age or younger, who had died from many causes, and found an incidence of polyps in 3 per cent. In 1948 Kerr[10] reported 100 cases of polyps of the colon in a total of 349 children seen for all complaints. There was no doubt that many of the children came to the office with symptoms produced by polyps; for this reason they were examined, hence so high a proportion of polyps in these children. Ladd and Gross[1] reported ninety-two cases of polyps treated at the Children's Hospital in Boston. In 1941 Kennedy[7] of the Mayo Clinic reported forty-nine cases. Diagnosis of polyps in children has greatly increased with the advent of double contrast x-rays to locate them, as well as the greatly increased number of proctoscopic examinations now being made. No doubt thousands of polyps have been removed in children, but only a very small number of series has been reported by clinics and individuals throughout the country.

The chief symptom of polyps in children is painless bleeding. Most frequently this blood is present as streaks in mucus. Bloody mucus in children without some type of acute intestinal condition is almost pathognomonic. It is the most constant symptom in the highest number of cases. The next most common symptom is prolapse of a mass at the anus, dark red, which may or may not bleed. Should there be obstruction to the venous return due to constriction by the anal sphincters about the pedicle, the color is purplish. The next symptom in order of frequency is cramping in the abdomen or in the rectum. This symptom is brought about by nature's effort to expel the polyp and traction on the bowel wall from intestinal peristalsis. Cramping of the abdomen is a more constant symptom if the polyp is in the sigmoid colon or above. If the polyp is sessile, the amount of cramping will be practically nil, in contrast to that produced by a long pedicle.

Intussusception due to polyps is unusual but it does occur. In the series of seventy cases reported herein there was no intussusception that produced symptoms of vascular disturbance. There were two cases in which there was intussusception proved by the distance of the polyp from the anus, since the polyp was passed outside the anus while still attached to the wall and the distance was too great to attribute this prolapse to the length of the pedicle. Diarrhea could not be attributed to the polyp in any of the cases in this series; however, diarrhea did aggravate many of the existing polyps.

With the history of painless bleeding from the rectum in children the first examination should be digital, then anoscopic and proctoscopic. Many times the disease can be found by these methods, thus avoiding further examination so difficult in children. Proctoscopic examination is carried out in the usual inverted position. In my opinion, using a child's proctoscope is neither necessary nor desirable. Good observation is difficult with a very small proctoscope; unless there is some congenital deformity the size of the anus, rectum and sigmoid colon is adequate and a regular $\frac{5}{8}$ inch proctoscope can be used without difficulty. The use of a child's proctoscope is a needless handicap, as an examination of the size stool that the usual child passes indicates the sigmoid colon, rectum and anus are usually of a caliber sufficient for an adult proctoscope.

X-ray study of the colon for polyps is most important for those polyps above the level of the proctoscope. This requires unusual skill in this field and a great amount of patience on the part of the roentgenologist. Not many roentgenologists will spend the time to do double contrast films on children; therefore diagnosis of polyps is sometimes overlooked. The first requirement for a good x-ray study is to have a clean colon, and one cannot get a clean colon with enemas only. A strong laxative is neces-

sary and in my experience castor oil is the best. When this is given, it should be in large enough dosage to cleanse the colon thoroughly and not just sufficient to produce liquid stools that adhere to the mucosa and leave small masses of formed stools. Three ounces of castor oil is not too large a dose for a three or four year old child. The problem of x-ray study of the colon is left to the roentgenologist. For a thorough examination in children double contrast x-ray is the only type that should be considered.

In the past nine years I have observed seventy cases of polyps in children in my private practice. Not all of these patients had surgical removal of the polyps, but sixty of the seventy did. In this series there were forty cases of polyps in males and thirty in females. This is about the same percentage as reported by Kerr[10] in his series of 100 cases in which there were fifty-six males and forty-four females.

TABLE I

Age	No. of Cases	Male	Female
0– 1	0		
1– 2	9	3	6
2– 3	8	4	4
3– 4	14	8	6
4– 5	13	8	5
5– 6	7	4	3
6– 7	5	4	1
7– 8	2	2	0
8– 9	3	1	2
9–10	4	3	1
10–11	1	1	0
11–12	4	2	2
Total	70	40	30

The greatest number of polyps was observed in children between the ages of one and six. The average age in this series was four and a half years. Table I shows age, incidence and sex of the cases reported.

In this series there were fifty-eight patients with polyps in the rectum, sixteen in the sigmoid colon and six with polyps above the sigmoid colon. There were fifty-two cases of single polyps, seven cases of two polyps, four cases of three polyps and three cases of four or more polyps. Only two patients had polyps in the rectum and lower sigmoid colon within reach of the proctoscope, and also polyps above this level, which would indicate that in most instances removal of polyps within the reach of the proctoscope is adequate. (Fig. 1.)

Twelve patients in this series required laparotomy with colotomy for removal of the polyps. (Table II.) In several cases the colon was opened in two, three or four places to remove the polyps as there was too great a distance between them for removal through one incision. Before laparotomy the colon was prepared with antibiotics or sulfa drugs; sulfasuxidine® was used in this whole series of laparotomies. Only one wound infection oc-

TABLE II

TWELVE PATIENTS UNDERGOING LAPAROTOMIES WITH COLOTOMIES

Name	Age	Sex	No. of Polyps	No. Benign	No. Malignant	Recurrences of Polyps	Wound Infection	Deaths
D. C.	5	M	2	2	0	0	0	0
M. L.	11	F	1	1	0	0	0	0
L. R.	4	F	1	1	0	0	0	0
L. W. S.	3	M	1	1	0	0	1	0
R. B.	4	M	1	1	0	0	0	0
B. A.	3	F	3	3	0	0	0	0
J. B. T.	3	M	1	1	0	0	0	0
C. C.	4	F	1	1	0	0	0	0
B. L.	3	M	2	2	0	1	0	0
L. L.	3	M	5	5	0	1	0	0
D. F.	6	M	1	1	0	0	0	0
M. N.	4	F	1	1	0	0	0	0
Total	Average age–4½	7 Male 5 Female	20	20	0	2	1	0

FIG. 1. Double contrast x-ray of the colon in a three and a half year old boy showing five polyps. No polyp could be visualized through the proctoscope.

FIG. 2. Double contrast x-ray of colon showing three polyps of descending colon removed by laparotomy with colotomy in three separate openings into colon.

curred and there was no instance of clinical peritonitis. Another important preoperative preparation is thorough cleansing of the colon; again I prefer castor oil in adequate dosage. Nothing is more distressing than to open an abdomen with an improperly cleansed colon and try to find a polyp that is 1 or 0.5 cm. in diameter. The roentgenologist has so thoroughly demonstrated the polyp that there is no doubt about its presence and it is up to the surgeon to find it. Passing the proctoscope through an opening in the colon and searching for polyps is a method frequently used, although I personally prefer palpation. With the colon cleansed, a polyp as small as 0.5 cm. can be easily felt through the wall. (Fig. 2.)

In eight cases in this series there was self-amputation of the polyp. There may have been more, but only those cases have been included in which there was clear evidence. Of these eight, four patients brought the polyp to the office, and on proctoscopic examination of two the pedicle was found and fulgurated.

The type of treatment was direct fulguration and electric snare, snaring the pedicle and removing the polyp for examination. For any polyp below the peritoneal fold the snare is used. I have made it a rule never to snare a polyp above the peritoneal level; there is certainly greater risk in using the snare above this level than in fulguration. To use fulguration without removal of the whole polyp for examination may cause concern as to whether the tumor was malignant, but a satisfactory biopsy can usually be obtained.

In two cases in this series polyps were identified by x-ray above the level of the proctoscope. These were observed over a period of time, and in one case after three years' observation the polyp was absent, evidently self-amputated. Neither the child nor the parent had observed profuse hemorrhage at any time. These polyps may become twisted upon the pedicle, cutting off the blood supply; self-amputation is then accomplished without severe bleeding. This has been reported many times.

In children the occurrence of malignancy from a polyp is unusually rare. Kerr[10] reported

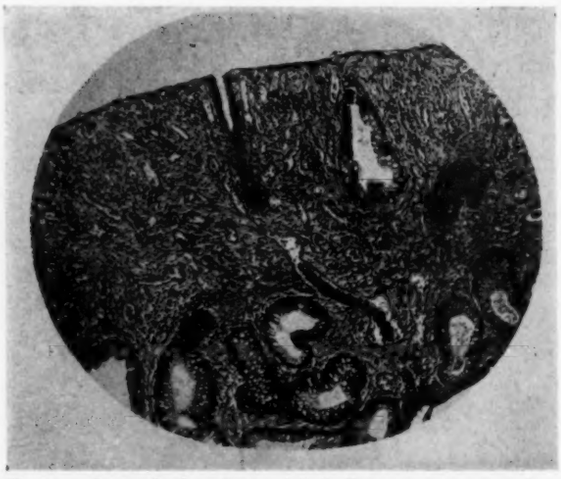

FIG. 3. A typical polyp with inflammatory reaction and erosion. The glands are hyperactive with many goblet cells. × 100.

two cases of definitely proven malignancy in a series of 100 cases; although this is a small percentage, it is sufficiently high for all polyps, even in children, to be considered potentially dangerous. The two patients Kerr reported on, however, were eleven and twelve years of age. No reported case of adenocarcinoma of the colon secondary to polyp could be found in patients below that age. More malignancies of the colon in children arise from other types of tissue, lymphosarcoma for an example. It makes a great deal of difference in the diagnosis of malignancy whether you mean infiltrating carcinoma or whether you mean a hyperactive gland with no evidence of breaking down of the glandular wall or of infiltration into the stroma. Nearly all polyps in children have the appearance histologically of very active glands.

In this series of seventy cases there were twenty-six patients who had complete removal of the polyp or polyps with histologic examination. The remainder of the polyps removed were either destroyed by fulguration and no attempt made to investigate the whole polyp, or the polyp could not be recovered. The reports of microscopic histology of these polyps are practically all the same. Usually they fall into two classes; those which are purely inflammatory and are rare, and those which are adenomatous with or without infection. A typical description of such an adenomatous polyp without ulceration follows:

"The stroma is loose and vascular. The glands are for the most part large and dilated. The epithelium is high columnar except in a few where it is flattened by pressure of the contents. Goblet cells are present. There is no ulceration of the surface. Immaturity and activity of the cells in some areas is attributable to youth of the tissue rather than to anaplasia. There is no evidence of malignancy." (Fig. 3.)

These polyps are sometimes called inflammatory, but Helwig[4] in his postmortem examinations did not find any cases of inflammation antecedent to the polyp. Keiller[12] believes that the inflammatory reaction is secondary in the polyp as a result of the fecal stream, traction on the polyps and irritation, and is not a basis for formation of the polyp but secondary to the trauma.

This paper includes polyps seen in children through the age of twelve. In reviewing my records I did not find any polyps in subjects between the ages of twelve and nineteen. This is food for thought. Where are the polyps between these ages? Why are no more seen? Are the greater number of polyps self-amputated by the time children reach the age of twelve? How long should the polyp be observed when it occurs above the level of the proctoscope and would require laparotomy? At what age should it be attacked? These questions have not been finally answered, and they will be only by an accumulation of data.

SUMMARY

1. This paper deals with polyps of the rectum and colon in children up to and including the age of twelve.

2. The incidence of polyps in children twelve years of age and younger is not known.

3. The most constant symptom of polyps in the rectum or colon is blood-tinged mucus.

4. Seventy cases are reported by the author with data as to age, sex and location of the polyps, with the number which required laparotomy with colotomy.

5. X-ray of the double contrast type is the only kind of roentgenographic examination that should be carried out.

6. The use of the adult proctoscope is most essential to a good examination.

7. There are many questions yet to be answered about polyps of the rectum and colon in children.

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DISCUSSION

ROBERT L. BELT (Glendale, Calif.): I should like to commend Dr. Harris on the presentation of his considerable experience with polyps of the rectum and colon in children. His paper showed the brighter and more hopeful side of the condition. The number of patients who get well by self-amputation of the polyps seems remarkable.

The registrar at the Los Angeles General Hospital checked the records on benign and malignant tumors of the rectum and colon for the last four-year period. There were ninety benign and 907 malignant tumors. In patients under twenty years of age there was only one benign and no adenocarcinoma reported.

I have found it good practice to study the patient sufficiently to be able to tell the radiologist that the bleeding is coming from above the visualized 5 to 8 inch level. The radiologist then has a definite problem which will encourage his use of skill and patience in making a diagnosis. I was told that the larger amount of castor oil is apt to leave at times somewhat confusing round defects on the film and that 1 to 1½ ounces is adequate.

The greatest incidence of polyps as reported by Dr. Harris was between the ages four to six. This seems to be the time of formation. Two of our patients, aged six, had previous polyps removed at ages two and four. It has been simpler for me to remove multiple polyps of the colon with a snare cautery through one bowel incision rather than through multiple incisions. There might be some advantage to inspection of the lumen of the colon over that afforded by multiple incisions or palpation.

After having heard two lectures on the transmission of hereditary traits through genes and having in our files a record of a seventeen year old boy with adenocarcinoma of the rectum, grade 2, I shall continue to consider these polyps with perhaps more concern than I should. It has been our practice to remove the polyps when diagnosed and advise air contrast barium enemas every five to ten years.

W. W. GREEN (Toledo, Ohio): A word of warning should be issued against the indiscriminate use of the snare in removing those pedunculated polyps that are seen through the sigmoidoscope. Just because they are visible does not mean that they are attached to the bowel wall at the level at which they are seen. This point was dramatically illustrated by a child whom I was asked to see in consultation. This girl had vague abdominal symptoms somewhat suggestive of an intussusception. At sigmoidoscopic examination I discovered a pedunculated adenoma in the sigmoid at about 20 cm. from the anal margin. Approximately six hours later she was examined by Dr. Blank and the polyp was in the lower rectal ampulla. An emergency operation was performed, and after reducing the intussusception I discovered that the polyp which had been seen low in the rectum was attached by a short pedicle to the wall of the left transverse colon. Although this polyp had been accessible through the sigmoidoscope, I believe that any attempt to remove it by the snare technic would have been unwise and might have resulted in serious consequences.

GEORGE H. THIELE (Kansas City, Mo.): There are two or three points which might well be brought out. The first of these is the relalationship between the pediatrician and the proctologist. During one year, three or four years ago, I believe that I saw at least forty polyps in children. I talked to some of the pediatricians and found that there had been a paper in one of the pediatric journals on the subject of polyps as a cause of bleeding in

children. Possibly we proctologists should do a little more missionary work with respect to polyps.

The second point which I wish to stress is that the x-ray diagnosis of polyps is a most difficult one, and repeated examination is often necessary. I wish to cite the case of a child of about four years of age. Bleeding was the chief complaint. Her hemoglobin was about 80 per cent. X-ray examination revealed a small polyp at the splenic flexure. Inasmuch as her condition was excellent, I advised deferment of the colotomy until she was a little older. Six months later additional films showed another small polyp just below the splenic flexure which had not been evident on the first examination. The following year, in 1949, preoperative films were made and much to everyone's surprise another pedunculated polyp 2 cm. in diameter was found in the lower descending colon. This polyp had not shown up on any of the previous films, and anyone, I believe, would think it was the oldest polyp of the three found. Colotomy was performed, the entire colon examined sigmoidoscopically and all polyps removed.

There is a third point which I would like to call to your attention. I believe it is inexcusable when opening the colon for polypectomy not to sigmoidoscope the bowel in both directions, because I cannot agree that one can feel all polyps and I do not think that the roentgenologist will find them all. If one is going to fulfil his obligation to the patient, he should determine beyond a doubt whether other polyps are present.

There are other conditions which must be ruled out in the diagnosis of polyps. In September, 1951, we did a colotomy on a little four year old girl who had been x-rayed five times, only the last two examinations showing anything suggestive of a filling defect in the sigmoid. No cause for her bleeding was found on careful sigmoidoscopic examination through the colotomy. Within the next few days I read the paper by Modell and Patterson (*J. A. M. A.*, September 8, 1951) reporting intestinal bleeding undoubtedly caused by the ingestion of aspirin through its coumarin-like action.

The other lesion which may cause bleeding and which may not be detected by x-ray examination is angioma. We have had two such cases.

DONALD J. PEARSON (Battle Creek, Mich.): I would like to ask Dr. Harris a question. On some of these polyps in children that are, as he called it, self-amputating, there is the possibility of rather profuse hemorrhage. What do you suggest doing about this hemorrhage? I ask this because I have had three cases in which that has happened and have "sat tight" and gotten by. However, I have always been quite worried over that period of several days during which those hemorrhages have subsided.

J. WADE HARRIS (Closing): I will first answer Dr. Pearson's question about self-amputation and hemorrhage. So far I have not encountered any hemorrhage which was to the critical point. However, I know nothing more that you can do other than to give plenty of blood and make sure by proctoscopic examination that the bleeding is not coming from a point low enough that it could be controlled by fulguration.

Then about castor oil: I formerly thought anyone who used castor oil was either ignorant or "old-fogyish," but after giving children 1½ ounces and seeing the inadequacy, I concluded the dosage was not sufficient If there is anything that will embarrass you it is opening an abdomen and finding the colon filled with fecal masses after 1½ ounces of castor oil had been given to a child. I therefore really give the patients a good dose.

Concerning the snare, personally I believe that whenever the abdomen is opened it is much safer to remove polyps by multiple incisions in the colon rather than one incision and using the snare for other polyps approximating. I sleep better that night. I believe that palpation externally and through a colotomy opening is accurate and almost any small lesion in the colon can be located in this manner.

THIERSCH'S OPERATION FOR ANAL INCONTINENCE AND MINOR DEGREES OF RECTAL PROLAPSE

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THERE is no doubt that the subject of prolapse of the rectum and its treatment has been of importance and recurring interest in all surgical centers and societies during the past fifty years. In the early years of this century Continental clinics in particular were much exercised by the problem, and the varying merits of treatment by colopexy, amputation and Thiersch's operation were discussed on many occasions. Although a search for Thiersch's original paper has proved unsuccessful, we have a very exact and authentic account of the origin of Thiersch's operation as recorded by Lenormant (1903). In this important and historical thesis Lenormant states that "it was in 1891 at the Congress of German naturalists and doctors at Halle that Thiersch described this procedure for the first time," and he proceeds to give a full description of the operation, probably in Thiersch's own words. It was Thiersch's hope that the operation would act in two ways: first, by mechanical replacement of the relaxed sphincter, and secondly, by the presence of a foreign body in the perianal tissues stimulating a proliferation of the cellular tissues, thus causing a solid adhesion between the rectum and neighboring parts.

Even at this early date (1903) Lenormant was able to collect the details of twenty-eight cases of Thiersch's operation, mostly from German sources, and it is evident that the results were for the most part very satisfactory; slightly later references to the operation were made by Picqué (1906), Lenormant (1907) and Ombrédanne (1912, 1913). (Fig. 1.) Besides these references we find in the unique and superbly documented monograph by Carrasco (1934) the names of many other famous surgeons who recorded their experiences of Thiersch's operation; it is indeed surprising to find in Carrasco's bibliography the references to three theses published in France between 1907 and 1919 which were entirely devoted to Thiersch's operation. Excellent descriptions of Thiersch's operation are to be found also in Hartmann's Chirurgie du Rectum (1931) and in Kirschner's Operative Surgery (1933).

In America a short note on the treatment of

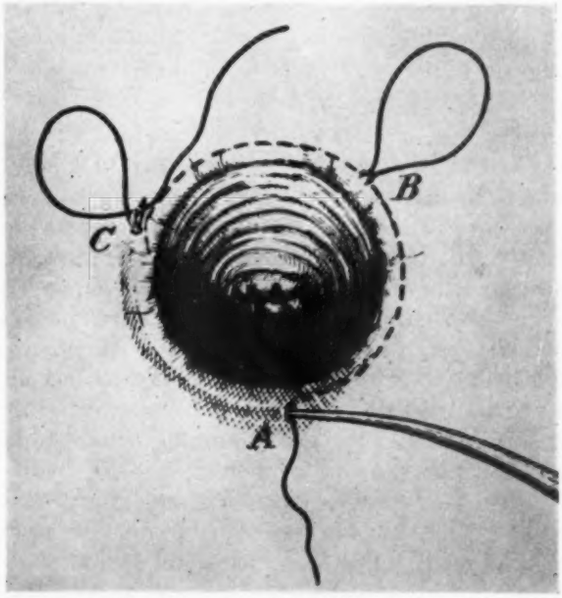

FIG. 1. Ombrédanne's original illustration (1912) of "cerclage de l'anus." (Published with the courtesy of Masson & Cie, Paris.)

prolapse in children by an encircling silk thread was recorded by Platt (1896), and Tierlinck (1908) presented a very interesting paper to the American Proctologic Society with an ingenious suggestion for fixing the wire. In 1923 Thiersch's operation was given an excellent description in Pennington's well known treatise on the rectum.

In Great Britain the only early reference appears to be that by Sir Charles Ball (1910) and with this exception no reference to the operation is found in any of the standard textbooks of the day, such as those by the Allinghams, Swinford Edwards, Goodsall and Miles, Sir Frederick Wallis, Harrison Cripps or Lockhart-Mummery. We have, however, a reference to Thiersch's operation which may be interesting to recall. In the summer of 1924 a joint meeting was held in London between the American Proctologic Society and the Sub-

section of Proctology of the Royal Society of Medicine. A discussion was held on prolapse of the rectum and in the course of the discussion Dr. Ralph W. Jackson (then President of the American Proctologic Society) said, "There is another form of rectal prolapse in infants and small children which has been overlooked in to-day's discussion . . . Where it has been necessary to interfere surgically I have had the best result by introducing a fine gauge bronze wire around the anus and burying it there. In other words the patient is given a wire sphincter. If aseptically introduced it is surprising how many weeks or months it may be left in. Eventually of course it has to be removed, but the annular cicatrix left remaining is a decided reinforcement of the sphincters."

TABLE 1

AGE GROUPS OF TWENTY-FIVE PATIENTS TREATED BY THIERSCH'S OPERATION (ALL FEMALE)

Age Group	No. of Cases	
31–40	1	8
41–50	4	
51–60	3	
61–70	8	17
71–80	8	
Over 80	1	
Total	25	

There was no comment on or addition to this contribution and one cannot but conclude that in Great Britain Thiersch's operation had either fallen into disuse or more probably had never been accepted as a useful method of treatment of rectal prolapse.

Revival of Thiersch's Operation. In January, 1948, I reported a preliminary series of eleven cases of anal incontinence, many being associated with partial prolapse of the rectum, which had been treated by Thiersch's operation (Gabriel 1948), and there now appears to be a considerable reawakening of interest in the possibilities of this method.

The surgical reports of St. Mark's Hospital show that in 1946 I performed one Thiersch operation and in 1947, six. In the subsequent years owing to the more general adoption by my colleagues of this method the numbers have risen as follows: in 1948 there were thirteen; 1949, eighteen; 1950, twenty-three; 1951, twenty-eight; 1952, eleven.

The following review concerns twenty-five different cases in which Thiersch's operation was performed on one or more occasions, comprising a total of forty operations.

All the twenty-five patients have been females. Their ages have varied from thirty-one (the youngest) to eighty-four (the oldest). (Table 1.)

It is evident that patients in the age groups over sixty preponderate and in fact the patients over seventy constitute slightly more than one-third of the cases treated.

Relationship to Childbirth. In this series seven women were spinsters. Of the remaining eighteen married women thirteen had had one or more children, the numbers ranging between one and ten, and five patients were childless. It appears, therefore, that childbirth has not been a factor in the condition under discussion and this is contrary to what one would be inclined to expect (thirteen parous, twelve nulliparous).

Indications for Thiersch's Operation. I should like to make it quite clear at the outset that I am not recommending Thiersch's operation for major degrees of complete prolapse of the rectum. No silver wire will stand up to this amount of pressure and in any case all the known facts of the pathology of rectal procidentia oppose such a simple solution. Also there is no question of recommending a Thiersch operation for a mucosal prolapse when the sphincter tone is normal, for in these cases a straightforward ligature operation is all that is needed.

My main thesis is the treatment of those miserable and usually aged subjects often unfit for any major operation, who present a relaxed sphincter which gapes widely on digital traction, with a partial prolapse of the rectum or possibly a short complete prolapse of not more than 2 inches in extent. Such patients are frequently deaf and quite incapable of cooperating with sphincter exercises; the operation then can be regarded only as a short-term policy when the patients treated have only a short-term expectation of life, or as we say now, this condition is often a "geriatric" problem.

The indications for Thiersch's operation fall into three main groups which are indicated as follows in order of frequency: (1) Anal incontinence due to relaxed sphincters, with a partial (mucosal) prolapse, or in some cases with a short complete prolapse. In the present series sixteen patients fell into this category, of whom eight were over seventy years of age. (2) Anal incontinence persisting after a previous major operation for complete prolapse of the rectum.

In this series eight patients come into this group, of whom six had previously been treated by rectosigmoidectomy, and two had had an abdominal operation by the Moschcowitz method. In these cases after an interval varying between six months and ten years after the major operation, it has become apparent that the resting tone of the anal sphincter was not improving or had relapsed after an initial improvement, with recurrence of mucoid leakage and either a short recurrent prolapse or a threat of commencing mucosal prolapse. (3) Anal incontinence due to trauma. In this series there was one such case, a woman aged sixty-seven, who fourteen years previously had sustained a complete division of the anal sphincter and anorectal ring in the course of a fistulectomy in the right posterior quadrant. A plastic operation, although initially helpful, did not ultimately prove satisfactory and a Thiersch operation gave her valuable relief for many months. The subsequent course of this patient is outlined later.

TECHNIC

Only routine preparation is required to ensure that the rectum is clean and empty. It is debatable whether prophylactic administration of sulphathalidine and streptomycin or other antibiotics is necessary for the average clean case at the first insertion of the wire, but this is certainly indicated for second or subsequent repeat operations, especially if the previous wire has had to be removed on account of ulceration with or without local sepsis.

The carefully sterilized silver wire, No. 19 or 20 S.W.G., is passed round the anus on a Doyen's needle. Only two short incisions ¼ inch in length are required; these are made in the middle line anteriorly and posteriorly with the pointed Bard-Parker blade (No. 11). The posterior incision should be 1 inch behind the anus, the anterior incision should be *as far from the anus as the perineum permits*. The wire is passed fairly widely on each side; and when we come to the passage of the wire anteriorly, I like to have it as far from the anus as possible because it is here, on the anterior aspect, that the wire seems most prone to ulcerate through the skin subsequently. Harold Dodd (1949) described another method of passing these wires, using large-bore straight aspirating needles, but I believe that the Doyen needle is a better method in that it enables a wider sweep to be made on each side of the anus and I think it is more reasonable to pass a curved wire on a curved instrument.

The circumferential passing of the wire being completed, the next and most important point is the twisting of the wire; this is where the surgeon's judgment and the cooperation of an intelligent assistant is essential. The wire should be twisted so as to leave a lumen that will admit the entire forefinger and as a rule this implies a diameter of the wire of 1¼ inches (3 cm.). A tighter wire will almost certainly lead to intractable fecal impaction, and I am now very careful about this point. When we consider that a patulous anus can very easily be stretched to 2 or 3 inches, a diameter of 1 inch as left by this operation can be considered to be a very adequate improvement. It would appear important that the two ends of the wire should be twisted equally in order to prevent a strain of unequal tension or a kink at the twist or the risk of one end pulling out under pressure from above, and three or four turns are advisable in order to prevent the ends becoming untwisted. (Fig. 2.) In order to facilitate any subsequent maneuver I always twist these wires in the same way, i.e., operator's left over right, in a clockwise direction.

When the wire has been suitably twisted, the assistant should agree that the lumen has not been encroached upon in the process and that his forefinger can be passed comfortably. The wire is cut with stout scissors or wire-cutting forceps and the twist is then turned posteriorly into the tissues which are pulled out with toothed dissecting forceps to help bury the wire. A puff with penicillin-sulfathiazole powder is given anteriorly and posteriorly and the two small incisions are closed either with Michel clips or by vertical mattress sutures of silkworm gut. The operator than passes a forefinger into the rectum and by means of a bidigital maneuver the twisted wire is turned still more posteriorly, that is, towards the coccyx, and in several of the lateral skiagrams shown this turn is evident.

The chief object in the after-treatment is to obviate fecal impaction in the rectum by means of mineral oil orally and glycerine suppositories per rectum. The anus is kept dry and the clips or sutures are removed on the fourth or fifth day. The patient can be up and out of bed as soon as thought desirable. Subsequently all that is needed is for the patient to resume

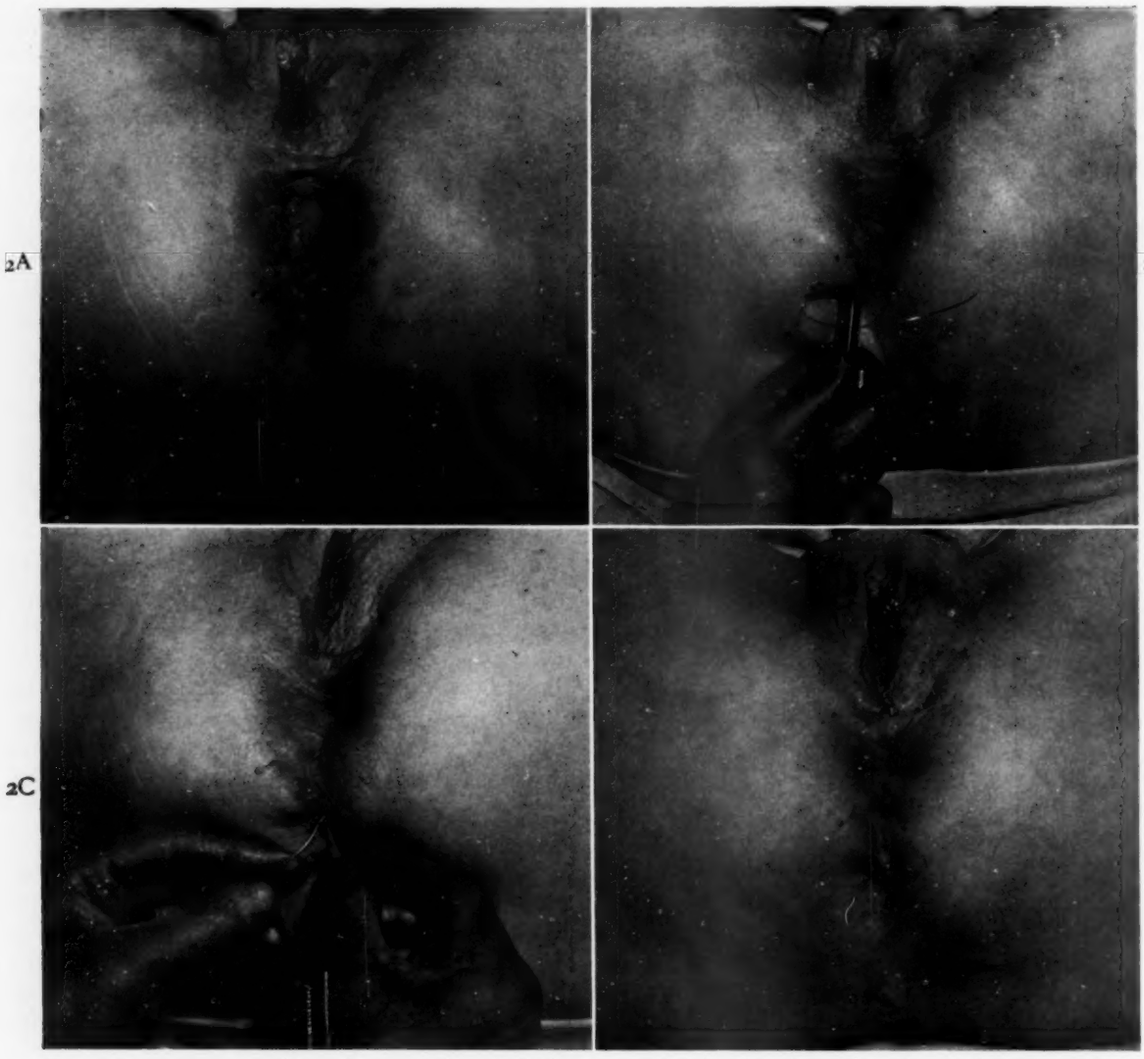

FIG. 2. Four stages in Thiersch's operation: A, before operation showing the extremely patulous anus; B, the wire has been passed around the left side of the patient's anus and is now hooked on to the Doyen's needle (passed around the perianal space on the right side) for completion of the encirclement; C, twisting the wire; D, the operation completed with Michel clips in front of and behind the anus. Note the closed appearance of the anus compared with A.

sphincter contraction exercises and an occasional examination should be made digitally to guard against a fecal impaction developing.

SUBSEQUENT COURSE

Once the silver wire is safely in position and the immediate postoperative difficulties overcome, especially a tendency to fecal impaction in the rectum, there are several alternative courses:

(1) The wire may be well retained giving good support without further comment or trouble for an indefinite time. (Fig. 3.) In my series the figures are as follows: wire retained for over four years, two cases; three years, five cases; two years, four cases; one year, seven cases.

(2) The wire breaks subsequently, usually just on one side of the twist; this has occurred in seven cases in this series and was presumably due to pressure from the prolapse or fecal impaction in the rectum, or to excessive straining efforts. As a rule the broken ends of the wire remain subcutaneous so that the broken wire can be removed and replaced in one session. In one case, however, when the patient was readmitted, it was found that the point of the wire was projecting through the skin; it was therefore removed and reinsertion of the wire had to be delayed for three months: after

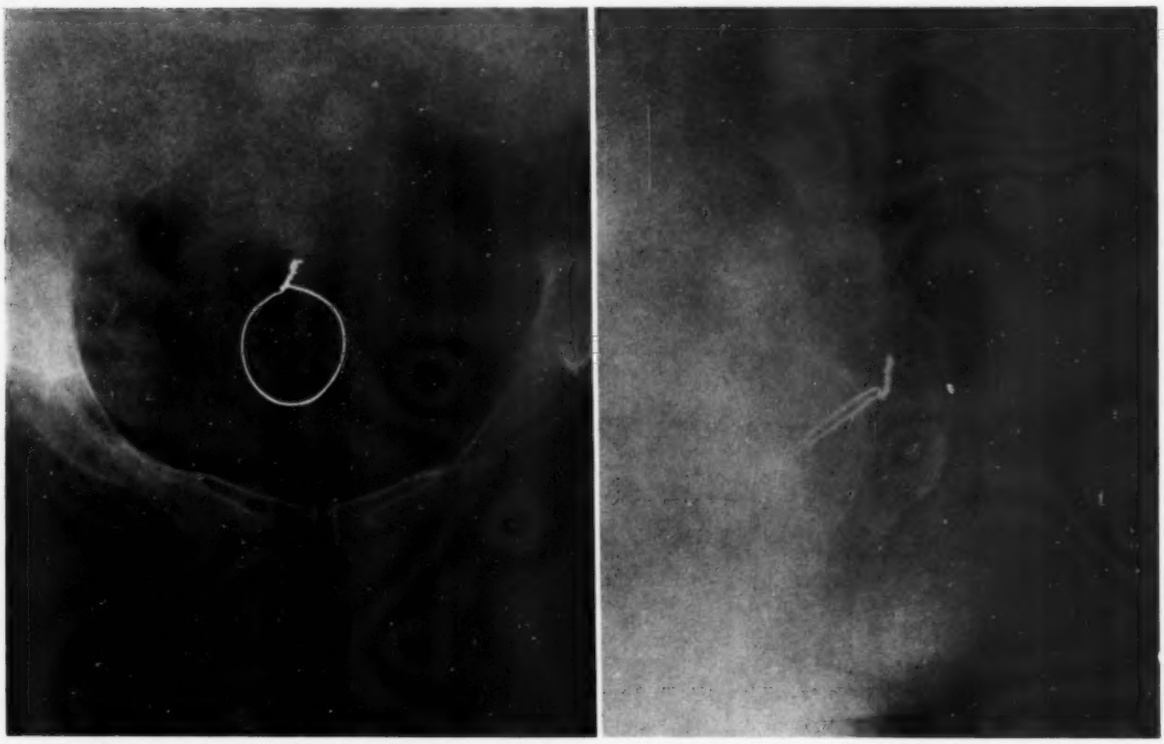

FIG. 3. The case illustrated has the longest retained wire in this series. Rectosigmoidectomy was performed in 1938 and Thiersch's operation in April, 1948 (female, aged sixty-four). She has remained well and free from symptoms to April, 1953, five years after operation, and the wire is still well retained in the tissues.

this the wire has remained quiet and satisfactory for three years and nine months. On two occasions the patient has felt the wire to give way suddenly; when examined clinically the wire was found to be impalpable and an x-ray has shown that it had become untwisted. In these cases the wire was removed through an anterior incision and then replaced by the usual technic.

(3) The most common complication is for the wire to ulcerate through the skin at the anal margin and this usually happens anteriorly; a slight degree of local inflammation and pain develop and inspection shows a short length of the wire exposed. This has occurred on eleven occasions in this series, four of them being in connection with the patient with a divided sphincter for whom a Thiersch operation was attempted on four occasions. In one case the end of the twist was found to be projecting through the skin; the wire was therefore cut on one side and it was removed without anesthesia being required. In no case has any spreading infection or cellulitis occurred and as soon as the exposed wire has been removed the infection in the perianal space has quickly subsided without relieving incisions being required. No doubt this has been due to the fact that the sphincter ani externus is relaxed and offers no impediment to drainage. Several months must elapse before Thiersch's operation should be repeated.

RESULTS

There has been no mortality from Thiersch's operation in this series and the later results of the operation can conveniently be summarized according to the three main groups of cases. (Table II.)

Group I. Cases of primary anal incontinence (sixteen cases): Six cases can be assessed as satisfactory without further surgery. In five of these cases the wire is well retained and has given efficient support for periods varying between one and a half and two and a half years; four of these patients were over seventy years of age at the time of operation, the oldest being eighty-four and she is still alive and well two and a half years later. In the sixth case the lumen afforded by the wire was considered to be slightly too large and fourteen months after the original operation I cut down on the twist

and gave it an additional turn. This patient continued well for six weeks short of five years after the original insertion of the wire, when examination showed that the wire was exposed anteriorly although she had no significant symptoms, and it was accordingly removed under pentothal® anesthesia. During the long time that the wire was in position the tone of her sphincter had improved enormously. Before the Thiersch operation the patient had a completely patulous anus for which two plastic operations, including a Wreden-Stone procedure, had been carried out without success; but when the wire was removed four years and ten and a half months later, she had a firm palpable sphincter with good resting and contractile power. There is no doubt that this represents a great change for the better and I think she will now be self-supporting without any adventitious aid.

Five patients died subsequently from old age or intercurrent disease at varying intervals up to three years after operation. In all of these cases the wire was well retained and satisfactory up to the date of death.

In two cases the operation had to be repeated for the second time and in one case for the fourth time. All these patients are now well, with the wires well retained and with symptoms greatly relieved.

In two cases the result must be considered unsatisfactory, but in no respect harmful. In one patient, the first of this series (1946), a doubled stainless steel wire was employed. It broke soon afterward and some years later when a complete prolapse became evident a rectosigmoidectomy was performed. The other patient proved to be very intolerant of the wire which soon became exposed, with superficial sepsis and after this happened again after reinsertion of the wire four months later she was subsequently found to have a complete prolapse and was treated by rectosigmoidectomy.

TABLE II

SUMMARY OF RESULTS (1946–1952)

TWENTY-FIVE CASES, COMPRISING A TOTAL OF FORTY OPERATIONS

	Alive and Well without Repeat Operation	Wire Satisfactory until Patient's Death from Intercurrent Disease	Thiersch's Operation Repeated with Ultimate Success	Result Unsatisfactory or Not Permanent
Group I Primary cases, 16.....	6	5	For second time—2 For fourth time—1	Female, age 72, broke wire and later had rectosigmoidectomy Female, age 49, had one repeat but again failed to retain wire; later had rectosigmoidectomy
Group II Secondary cases, 8.....	3	1	For second time—3	Female, age 52, method abandoned after fourth Thiersch operation; no further procedure
Group III For trauma to sphincter, 1...	..	..	..	Female, age 67, method abandoned after fourth Thiersch operation; later had excision of rectum
Total, 25 cases.....	9	6	6	4

Group II. Cases of secondary anal incontinence (eight cases): My results indicate that Thiersch's operation is a particularly valuable procedure in these cases. Within three to six months after a rectosigmoidectomy or Moschcowitz operation for complete prolapse it should be apparent whether the patient has or has not the capacity to improve the sphincter tone by exercises, aided if necessary by faradism. In the aged and deaf subjects particularly I submit that a Thiersch operation should be considered

as a valuable and effective supportive procedure when the sphincter tone remains inadequate and as soon as (or preferably before) a recurrent prolapse becomes evident.

Of eight patients treated, three are now alive and well after the original operation for periods of eleven months, two and a half and four and a half years, respectively, and one patient died of cardiovascular degeneration three years and three months later after having had continued relief from the Thiersch wire.

In three cases Thiersch's operation has been repeated once and thereafter the result has been satisfactory in each case for periods of two, two and one-half and three and one-half years, respectively. One of these patients successfully had a gynecologic procedure performed for cure of rectocele and cystocele, with no disturbance to the wire which remains sterile and intact for nearly a year after the vaginal plastic operation.

In only one case in this group has the Thiersch operation finally had to be abandoned. This was a heavy subject with a completely patulous anus and a massive large complete rectal prolapse for which three operations had previously been performed in Germany. In June, 1946, I did a Moschcowitz operation which cured her prolapse but her sphincter remained completely atonic and a Thiersch operation was done six months later. Either on account of breaking or exposure of the wire the operation had to be repeated until a total of four Thiersch operations had been done. After the fourth insertion of the wire it very soon became exposed anteriorly and had to be removed. This case, however, must not be adjudged a complete failure because the patient now has a much better sphincter tone than she ever had before and I think it is reasonable to conclude that the Thiersch wire has given her valuable support on and off for three and a half years, during which time she has made a successful effort to resume her sphincter contractions; possibly some perianal fibrosis has assisted the functional result.

Group III. For anal trauma: There has been only one case under this heading (female age sixty-seven). The first Thiersch operation gave good relief from February, 1948, to June, 1949, when the wire became exposed through the scar in the right posterior anal quadrant and had to be removed. Re-inserted in May, 1950, it lasted till January, 1951. The third Thiersch operation was in June, 1951, and lasted till November, 1951, and the last and final insertion in May, 1952, lasted for only four days when low grade infection supervened and the wire was removed. By this time a large complete prolapse with great incapacity had developed and in October, 1952, I carried out a radical excision of the rectum. The patient now has a satisfactory terminal colostomy, she is fully ambulant and is very pleased with the result. However, it is fair to compute that Thiersch's operation gave her substantial relief for approximately thirty months during a period of four and a half years until a colostomy life became necessary.

CONCLUSIONS AND SUMMARY

1. Thiersch's operation has proved to be a valuable procedure in the types of anal incontinence indicated previously, especially in aged subjects. The operation has enabled many of these old people to be reasonably ambulatory so far as their age and strength permits, without their rectal function being a nuisance to themselves or to their relations.

2. Thiersch's operation is suitable for some cases of relaxed sphincter even if a short complete prolapse has developed, but is not recommended for a bulky major complete prolapse of the rectum. It has proved to be particularly valuable as a secondary procedure when the anal sphincter remains patulous after operation for a major prolapse of the rectum.

3. The complications are breaking, untwisting and ulceration of the wire, and the incidence of these is mentioned. Perhaps one of the best and final tests of the efficacy of Thiersch's operation has been given by the patients who have suffered the unfortunate complication of sudden breaking or untwisting of the wire. When this has happened, they have immediately returned with the request that the wire should be "put back" as soon as possible.

4. Of the total series of twenty-five cases, twenty-one can be assessed as satisfactory (six after one or more repeat operations); four should be regarded as unsatisfactory and three of these later had a major operation performed but in no case was any ultimate harm done by attempting Thiersch's operation.

5. Finally, improvements in materials and technic can easily be forecast. For instance gold or platinum wire of a similar gauge might prove to be better not only in regard to

strength and malleability but also from the psychologic point of view. Instead of the crude method of twisting the wire it might be an improvement merely to overlap the wires, turn back the ends and then by means of a neat electrically heated welding tool to fuse them together in perfect alignment and thus avoid some of the complications that have been enumerated. Or perhaps we shall revert to some pliable, non-absorbable material, and of these thread, silk, rubber, tendon and fascia lata have all been tried in the past. Of the newer substances now available strong nylon or a heavy gauge braided stainless steel wire may prove to be ideal.

In conclusion I should like to pay a tribute to the memory of that great and original surgeon, Thiersch, whom this paper commemorates, and of his contemporaries who practiced this operation in the early nineties: Lücke of Strasbourg (six cases), Von Bramann of Halle (six cases), Von Angerer of Munich (thirteen cases) and Rotter of Berlin (two cases). Their cases were carefully collected and recorded in detail by Lenormant and it is a happy coincidence that 1953 marks the fiftieth anniversary of the publication of Lenormant's famous and oft quoted thesis on prolapse of the rectum.

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AN INVESTIGATION INTO THE EFFECTS OF ALTERED ACID-BASE EQUILIBRIUM UPON THE MOTILITY OF THE COLON*

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In the course of experimental alkali therapy for artificially induced ammonium chloride acidosis, one of us (M. J. O.) heard intense borborygmi and observed loose, watery, and occasionally bloody bowel movements.[1] No explanation would be given at the time for the acce!erated peristalsis accompanying acidosis. In this study experimental acidosis was induced using the ammonium salts of the mineral acids intravenously instead of the organic acids which were oxidizable and thus unsuitable.[2] Toxic reactions, when present, have been proven to be due to the ammonium ion and not to the acidifying effect of the salt.[3] Moreover, the appearance of toxicity seemed directly related to the rate of administration and not to the total amount given.[3] In our experiments, care was taken to give the ammonium chloride at rates slower than that which would cause ammonium intoxication. Furthermore, it has been shown earlier that the response of smooth muscle can be modified by changes in length[4–6] and more recently by changes in acidity.[7–9]

This investigation is an attempt to explore the matter farther in an effort to determine the physiologic and pharmacologic behavior of the colon under conditions of altered acid-base balance.

Within recent times numerous attempts have been made to simplify and standardize the nomenclature used in the experimental study of intestinal movements. For the purposes of this paper we shall limit the meaning of those terms as may be indicated below. The caliber maintained by or the resistance offered by the intestinal wall against distention is called tone.[10–11] The term motility shall include all spontaneous muscular activity, whether it results in actual propulsion or mixing only occurs. Propulsion or transport shall refer only to the forward movement of the intestinal contents. Rhythm shall denote the presence of a more or less constant rate and pressure among the contraction waves, such that the latter conforms more or less to a definite pattern.[12] It has been wisely advised that intestinal motility be studied in man if the conclusions are to be drawn for the human being.[11] However, it has been shown earlier that despite apparent gross anatomic differences between the human and the canine colons, their motor activity is strikingly similar,[13] and that there is sufficient similarity to make the results significantly conclusive.[14,15]

The classification of the basic wave patterns into types I, II, and III as previously designated by earlier workers is adhered to here.[13,14,16,17] Type I waves are small, simple, and non-propulsive.[17] Type II waves are also simple, but they are of much greater dimensions than type I; they are mixing waves and are probably responsible for the haustrations.[17] Type III waves are complex and represent either type I or type II waves or both types superimposed upon a change in tonus; they are neither propulsive nor mixing.[17] Type IV waves, which have been described only in man, are large, smooth waves of a propulsive nature.[17]

METHODS

Mongrel dogs of both sexes weighing 5 to 15 kg. were used. They were trained to lie quietly on their sides and were inoculated against distempter two weeks preoperatively. They subsisted on hospital scrap food which was supplemented by enriched laboratory feed. A median cecostomy was performed using a sterile technic. This in effect was a colostomy, because the flexuous cecum[18] was exteriorized and made to slough off at the ileocecal junction.

Registration of colonic pressures, i.e., both the intraluminal pressure variation and the tonal pressure changes in the wall, was per-

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This paper received the Hermance Award for 1953.

formed using a set-up that was devised after the open-tube electromanometer principle.[19] The pressures in both the proximal and distal segments of the colon were recorded simultaneously but separately. For the proximal colon the recordings were taken from a point cally controlled single-filament zirconium lamp. (Fig. 1.)

A modification of Jacob's apparatus for continuous intravenous drip into unrestrained animals was utilized.[20,21] (Fig. 2.) One external jugular vein was cannulated with a siliconed,

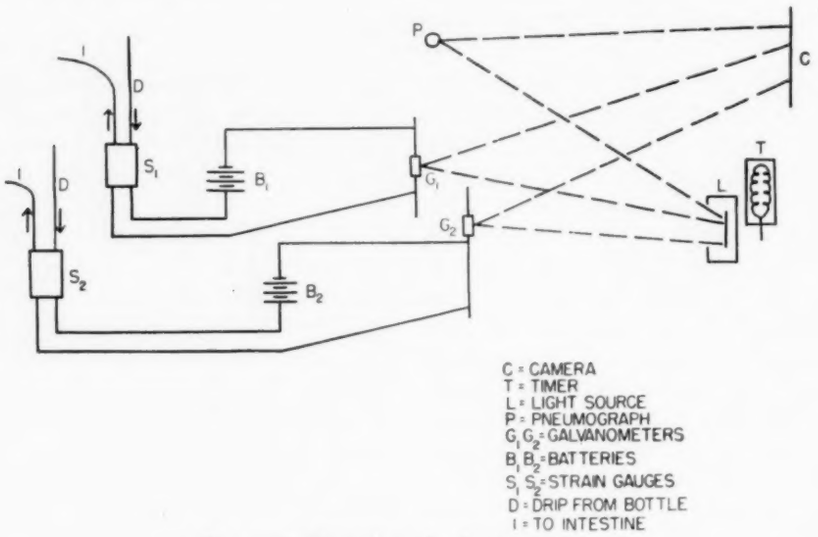

FIG. 1. Registration of colonic pressures.

7 cm beyond the abdominal fistula, and for the distal colon the recordings were made from just beyond the anal sphincters. A French No. 6 silk woven, whistle-tipped ureteral catheter served as an open tube through which the pressure was transmitted to a strain gauge (Statham capsule Model P23) which was energized from a bank of dry cell batteries (with a total of 6 to 9 volts). This converted the pressure changes to proportionate electrical impulses. The other end of the strain gauge was connected to a Marriott storage bottle containing saline solution which dripped at a constant rate of 5 drops per minute and served to prevent fecal obstruction to the pressure conduction system. The transducer output was then fed to an optical galvanometer (Consolidated string galvanometer) mounted one meter from a slowly moving camera (Walters-Conley Model G-18) using seismographic paper. This electrical circuit was completed by connecting the galvanometer to the same bank of dry cell batteries. A Manning pneumograph attached to a tambour, with a suitable mounted planoconcave mirror at its rim, made simultaneous control respiratory tracings. Time was registered by the periodic flashing of an electroni-

polyethylene tubing held in place by transfixion sutures and dressings such that the plastic tubine projected about 2 inches alongside the neck. Several circular turns of bandage wound around the neck reinforced the dressings and covered the entire collar except for its attached metal ring which hung outside the dressing, a little behind but on the same side as the plastic tube. The animal was kept in a metabolism cage set in a quiet corner of the laboratory. About a meter above the roof of the cage was placed a 5-L. Marriott storage bottle containing freshly prepared M/5 ammonium chloride solution. (A freshly prepared solution was used for each experiment.) A rubber tubing led from this bottle to a syringe (S) with a drop counter interposed. The barrel (B) of the syringe was encased in a copper cylinder (C) which was made tight-fitting by several layers of thin rubber tissue. The piston (P) of the syringe was ground sufficiently to allow its free and adequate rotation inside the barrel and then was cut at both ends. To the upper end was annealed a glass adapter (A) which fit the rubber tubing leading from the storage bottle above. The lower end of the piston opened directly into the barrel about two-thirds of the

way. From the tip of the barrel of the syringe led a small bore rubber tubing which was connected by a small metal adapter to the polyethylene cannula inserted into the external jugular vein. The piston was attached to the cage to insure farther that the hydrostatic pressure in the delivery system would remain unchanged. The dog was able to walk inside the cage without impeding the free and regular flow of the solution. There was enough slack in the rubber tubing connecting the storage bottle to the infusion cannula to allow the dog to lie down at will. This slack was, however, taken up by a bicycle chain (BC) which was connected at one end to a steel spring (SS) hooked to the base of the encasing copper cylinder (C) and the other end to the metal ring on the dog's collar.

To ascertain the pharmacologic and physiologic response of the colon, numerous control records were made for each dog after injecting standard doses of B-diethyl aminoethyl l-cyclohexylcyclohexane carboxylate hydrochloride (bently®)[22] and acetyl B-methylcholine chloride (mecholyl®)[23] under normal acid-base condition, and later during progressive acidosis, with at least thirty minutes being allowed for the full development and establishment of the full pharmacologic effect. Sufficient time was allowed to elapse between the different injections such that only an uncomplicated and accurate picture of the pharmacologic effect for each particular chemical used was obtained. Control determinations of serum levels of carbon dioxide content were made, using a modified method of van Slyke and Neill,[24] pH measured at 38°c. using a Beckman glass electrode pH meter, and serum chlorides using the mercuric nitrate method of Schales and Schales.[25] After determining the basal levels of these different biochemical criteria, the experiments followed a set pattern.

All experiments were started early in the morning. The dog was rendered acutely acidotic with a continuous intravenous infusion of freshly prepared M/5 ammonium chloride solution, usually dripping at the rate of 20 drops per minute. Blood samples were withdrawn from the femoral artery under anaerobic conditions, then allowed to clot and the serum carefully withdrawn under oil, following the precautions advised by Austin.[26] The serum values of the different biochemical criteria mentioned previously were then determined and the degree of acidosis was ascertained. For convenience and the purposes of this paper the state of acidosis was arbitrarily divided into two stages: (1) a stage of mild acidosis, with serum pH measured at 38°c. as pH 7.2–7.3, and the serum level of the carbon

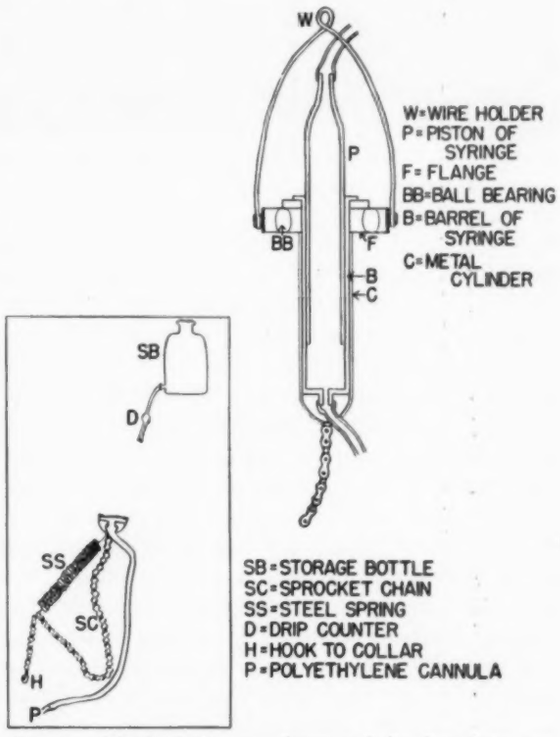

FIG. 2. Method for continuous injection into unanesthetized unrestrained dogs.

dioxide content was 20–30 volumes per cent; and (2) a stage of severe acidosis with a serum pH measured at 38°c. as below pH 7.19 and the serum carbon dioxide level is less than 19 volumes per cent. Usually in four to six hours' time from the start of the intravenous drip the stage of mild acidosis is reached and a series of both pressure recordings is made. Each recording session was divided to show successively (1) the effect of acidosis alone, without any injection of drugs; (2) the effect of mecholyl® chloride injection (0.25 mg. injected intramuscularly); (3) the effect of the injection of bentyl® hydrochloride (2 mg./kg. body weight injected intramuscularly); and (4) the effect of a repeat dose of mecholyl chloride. The drip was discontinued temporarily while recordings were being done. In all these recordings we took the same precautions mentioned previously to obtain, as much as possible, an

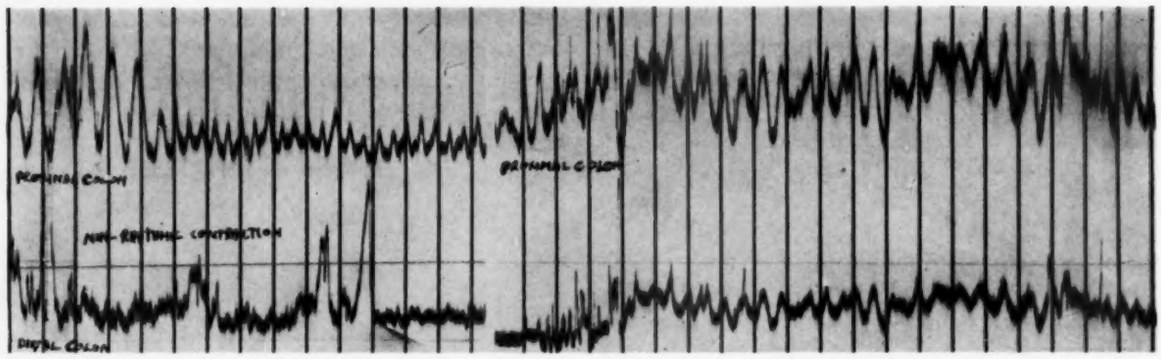

FIG. 3. Two fundamental types of activity in proximal and distal colon of trained unanesthetized dogs. Top record, proximal; second, distal.

uncomplicated and accurate picture of the pharmacologic effect of the drug being utilized.

After the recording session the dog was returned to its cage and the intravenous drip resumed for the night, at the same or even a slower rate. The dog was examined several times to be sure that acidosis did not set in too fast and kill the dog during the night. Early the next morning, arterial blood samples were collected again, and if the dog were in a state of severe acidosis, another series of recordings was made. If the dog was not in severe acidosis, the drip was accelerated till severe acidosis was induced without killing the animal or causing ammonium intoxication. This second recording session was divided into four parts to show: (1) the effect of severe acidosis alone without any drug injection; (2) the effect of the intramuscular injection of 0.25 mg. of mecholyl chloride into the severely acidotic dog; (3) the effect of the intramuscular injection of bentyl hydrochloride (2 mg./kg. body weight) into the severely acidotic dog. The dogs were then treated with an intravenous injection of 5 per cent sodium bicarbonate solution, giving an amount that has been computed as necessary to bring the carbon dioxide content of the serum to the pre-acidotic or normal level for the animal.[27] This ended the experiment and the animal was replaced in its cage to recover.

RESULTS

As acidosis sets in and deepens the signs noted by previous investigators were also observed. Sialorrhea, vomiting and the excretion of a highly colored, strongly ammoniacal urine were fairly constant. The animals ate and drank little and by the second day appeared dehydrated and hyperpneic. Lethargy may set in during very severe acidosis. Rumbling borborygmi were audible but diarrhea was not marked as in the series in which ammonium chloride was given by mouth.[1] A few of the dogs in very severe acidosis died (pH of serum measured at 38°C. was pH 7.05 or less, and the serum carbon dioxide content was less than 15 volumes per cent in these particular dogs). In these dogs that died the signs of severe acidosis progressively grew worse despite a temporary improvement following alkali therapy. The intravenous injection of sodium bicarbonate did not raise the serum pH and serum carbon dioxide content immediately to the control levels, but it improved the animal definitely and within a day or so, if the animal survived, it appeared to be its normal self again.

Calibration of the pressure tracings were done immediately after each recording session, using a water manometer for the quantitative analysis. The height of the trough of the contraction wave from the base line we considered as the tone. The amplitude of the contraction wave itself we considered as the intraluminal pressure variation. The percentages of total rhythmicity is the percentage of total experimental time during which the contractions are rhythmic in the whole colon. The percentage of segmental rhythmicity is the percentage of total experimental time during which rhythmic contractions are present in a segment of the bowel.

In the analysis of the rhythmicity we classified all the wave patterns into either type I or type II, regardless of whether they appeared as simple wave patterns or were superimposed upon a tonus change. (In the later cases they were classified into type III waves and then subjected to further analysis using different parameters.) Type III waves were analyzed in

the light of intraluminal pressure variations and the duration of the tonal changes only. We were not able to demonstrate any type IV waves in our records. We performed a total of twenty-nine complete and identical experiments on seven dogs. (Fig. 3.)

do not differ much between the proximal and distal segments of the colon, except that in the latter segment the waves of all types have lower tone and less intraluminal pressure variation. In the distal segment type III waves are also of shorter duration. This confirms previous

TABLE 1*

	Incidence (%)	Rate (per min.)	Tone (cm. H_2O)	Intraluminal Pressure Variation (cm. H_2O)
Proximal Segment:				
Type I Wave Pattern				
Normal	37.5	3–7	6.0	2.3
Mild acidosis	−5.6	−1.0	−3.5	−0.3
Severe acidosis	52.5	−0.5	−0.9	−1.2
Remark	.....	dec.	dec.	dec.
Type II Wave Pattern				
Normal	62.5	1	8.0	6.3
Mild acidosis	5.6	0	−4.5	−3.3
Severe acidosis	−52.5	0	−2.5	−2.5
Remark	.....	.....	dec.	dec.
Type III Wave Pattern	.....	duration	.....	.....
Normal	.....	6–10	10.0	8.0
Mild acidosis	.....	−2.0	−7.5	−7.0
Severe acidosis	.....	absent	absent	absent
Remark	.....	dec.	dec.	dec.
Distal Segment:				
Type I Wave Pattern				
Normal	45.4	3–7	6.0	2.0
Mild acidosis	22.0	−1.5	−3.4	−0.4
Severe acidosis	−6.8	0.5	0.4	0.7
Remark	.....	.....	.....	dec.
Type II Wave Pattern				
Normal	54.6	1	7.5	4.0
Mild acidosis	−22.0	0	−5.0	−1.0
Severe acidosis	6.8	0	−0.1	−1.8
Remark	.....	.....	.....	dec.
Type III Wave Pattern	.....	duration	.....	.....
Normal	.....	2–6	9.0	3.0
Mild acidosis	.....	2.0	−7.0	−1.0
Severe acidosis	.....	−3.5	1.0	−1.0
Remark	.....	.....	.....	.....
Percentage of Segmental Rhythmicity:				
	Proximal Segment		Distal Segment	
Normal	64.0		68.9	
Mild acidosis	7.0		−3.7	
Severe acidosis	22.1		18.0	
Remark	inc.		.....	

* Shows the trend of change in the different parameters of the wave patterns in both the proximal and distal segments of the canine colon under conditions of normal and altered acid-base equilibrium.

Normal Acid-base Equilibrium (Table 1). Rhythmic contractions are present in the colon under normal acid-base balance about two-thirds of the time (64 per cent for the proximal segment and 68.9 per cent for the distal segment).

The basic configuration of the wave patterns

studies.[16] Type II waves are more prevalent in either segment although the percentage incidence of type II waves is much greater in the proximal than in the distal segment (62.5 per cent compared to 54.6 per cent).

In the proximal colon, on the average, type I waves have 37.5 per cent of the segmental

rhythmicity although some dogs may not show them at all. They occur at the rate of 3 to 7 per minute and have a tone of 6 cm. of water pressure, with an intraluminal pressure variation of 2.3 cm. of water pressure. Type II waves form 62.5 per cent of the segmental rhythmicity,

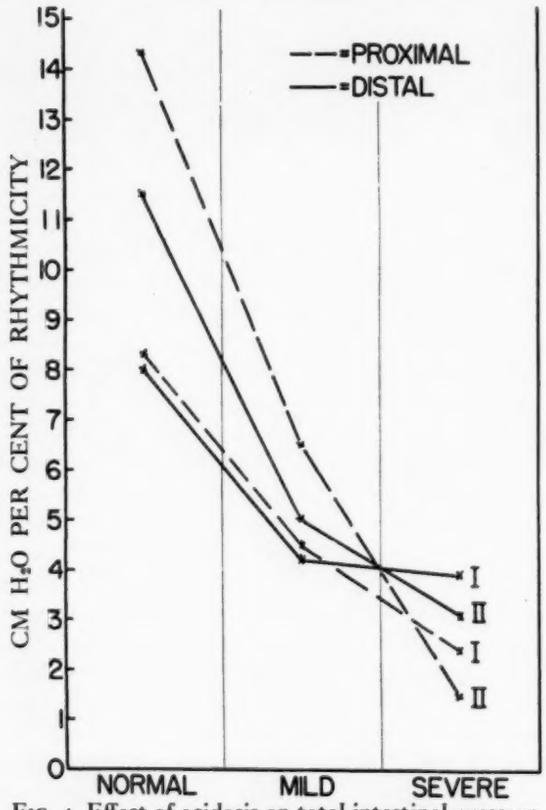

FIG. 4. Effect of acidosis on total intestinal pressure.

(⅝ of the total) and occur at the uniform rate of one every minute. They have a tone measured as 8 cm. of water pressure and an intraluminal pressure variation of 6.3 cm. of water pressure. Type III waves are not always present, just like type I waves. They persist for at least six minutes and are usually over in ten minutes although they may last as long as twenty minutes. Their tonus (10 cm. of water pressure) and intraluminal pressure variation (8 cm. of water pressure) are higher than for either type I or type II in their simpler forms.

In the distal segment type I waves constitute 45 per cent of the segmental rhythmicity and are more constant than in the proximal segment. They occur at the same rate, 3 to 7 per minute, and have a tone of 6 cm. of water pressure (equal to that of the proximal segment), and an intraluminal pressure variation of 2 cm. of water pressure (slightly less than in the proximal segment). Type II waves constitute 55 per cent of the segmental rhythmicity (less than in the proximal segment) and are less constant than in the proximal segment. Type III waves are more constant in the distal colon but do not last as long (2 to 6 minutes compared to 6 to 10 minutes), nor have as much tone and intraulminal pressure variation as in the proximal segment.

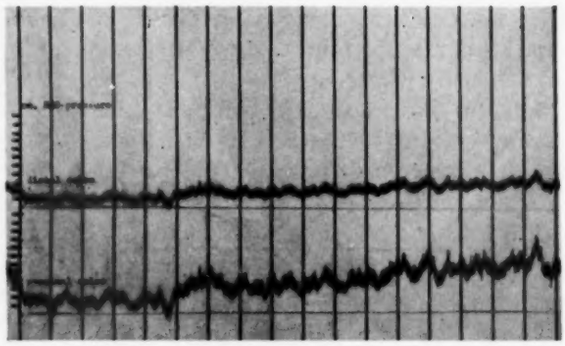

FIG. 5. Colon pressures in severe acidosis. Upper record, distal colon; second record, proximal colon. Calibration at left applies separately to each record; divisions in cm. H_2O.

Altered Acid-base Equilibrium. The onset of acidosis was characterized by a decrease in rate, tone and intraluminal pressure variations in both the proximal and distal segments (Fig. 4) of all the three types of motility. (Fig. 5.) The duration of type III waves was shortened. The incidence of type II contractions conformed to the pattern by showing a reduction as did the percentage of segmental rhythmicity in the proximal segment. Increased incidence of activity was found in type I contractions in both proximal and distal segments. The percentage of segmental rhythmicity was increased in the distal segment with increasing acidosis. (Figs. 6 and 7.)

Effect of Acetyl B-Methyl Choline Chloride (Mecholyl) (Table II). 1. *Proximal colon during normal acid-base conditions:* The incidence of type I contractions was decreased and type II increased by mecholyl chloride. Duration of type III contractions was decreased. The most outstanding change was the increase in intraluminal pressure variation for both types II and III. Rate and tone changes were small.

2. *Proximal colon during fully developed acidosis:* Under these conditions the direction of the effect of mecholyl chloride on the incidence of type I and type II contractions was unchanged, (whether excitatory or inhibitory) but was more effective. The direction of

effect on the duration of type II contractions was reversed from a decrease to an increase. The spectacular effects of mecholyl chloride on intraluminal pressure variation seen during normal acid-base condition in types II and III were still in the same direction but were reduced

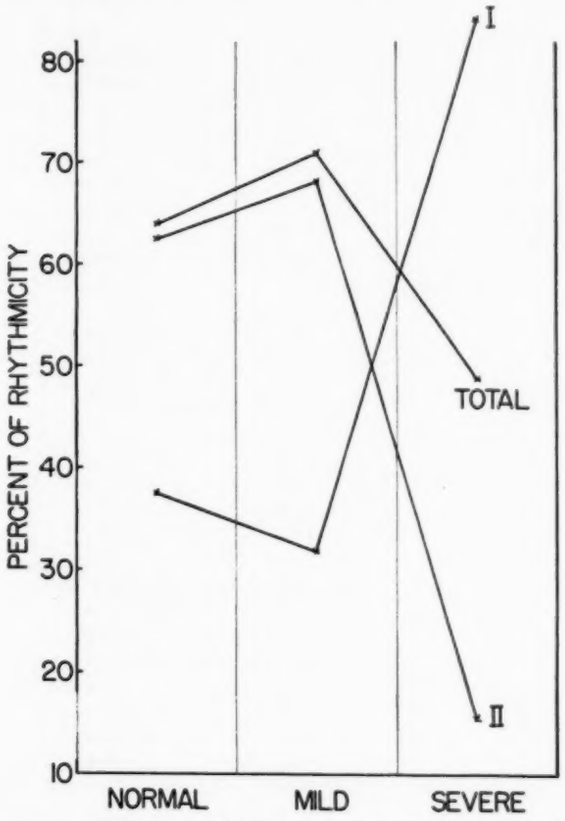

FIG. 6. Effect of acidosis on per cent of total and segmental rhythmicity in proximal colon.

to only one-tenth as much in type II and only one-fifth as much in type III. Rate and tone changes were not remarkable.

3. *Distal colon under normal acid-base condition:* The incidence of type I contractions was increased and type II decreased by mecholyl chloride. Duration of type III contractions was unchanged. Only in type II waves did the intraluminal pressure variation show any marked increase. The intraluminal pressure variations in the other two types, and the changes in rate and tone were not notable under the influence of mecholyl chloride.

4. *Distal colon during fully developed acidosis:* Under this condition the effect of mecholyl chloride was always in the same direction as normal but was much less effective. Exceptions were in type III in which the direction of effects was also unchanged, but the duration was much longer and the intraluminal pressure variation increased a little.

When the percentage of segmental rhythmicity was determined, mecholyl chloride increased it under normal acid-base condition

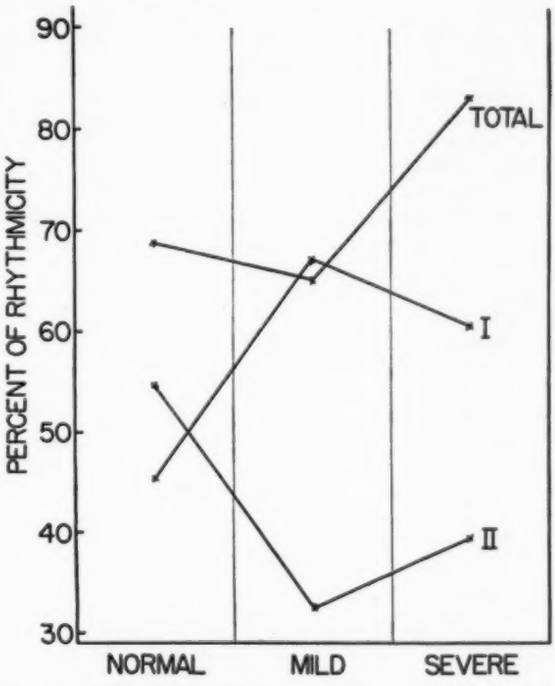

FIG. 7. Effect of acidosis on per cent of total and segmental rhythmicity in distal colon.

in the proximal colon but reduced it slightly in the distal colon. During acidosis the effects were in the same direction but were less effective proximally although more so distally. It should be pointed out that as acidosis develops to the severe stage, the results obtained in that condition were oftentimes preceded by the opposite change as the animal passed through the stage of mild acidosis. (Figs. 6 and 7.) This was true for the percentage incidence of type I (in both proximal and distal segments), percentage incidence of type II (in the proximal segment only), intraluminal pressure variation of type III (in the distal segment only) and for the tone of type III (in the distal segment only). A similar result was obtained in the distal colon for segmental rhythmicity.

Effect of Diethylaminoethyl l-Cyclohexylcyclohexane Carboxylate Hydrochloride (Bentyl) (Table III). 1. *Proximal colon during normal acid-base condition:* Bentyl hydrochloride increased the incidence of type I contractions but decreased that for type II. Intraluminal pressure

TABLE II*

	Incidence (%)	Rate (per min.)	Tone (cm. H_2O)	Intraluminal Pressure Variation (cm. H_2O)
Proximal Segment:				
Type I Wave Pattern				
Normal	−6.2	0	2.0	0.7
Mild acidosis	1.4	−0.5	0.1	−0.2
Severe acidosis	−20.3	0	0.7	−0.3
Remark	.....	.....	inc.	.....
Type II Wave Pattern				
Normal	6.2	0	0	47.7
Mild acidosis	−1.4	0	0.1	0.5
Severe acidosis	20.3	0	2.7	4.5
Remark	.....	.....	inc.	inc.
Type III Wave Pattern	.....	duration	....	.....
Normal	.....	−4.0	0	20.0
Mild acidosis	.....	0.5	0	0.4
Severe acidosis†	.....	5.0	1.5	4.0
Remark	.....	.....	....	inc.
Distal Segment:				
Type I Wave Pattern				
Normal	22.3	−1.0	4.0	1.5
Mild acidosis	−3.0	0	1.0	1.1
Severe acidosis	7.4	−0.5	0.8	0.3
Remark	.....	.....	inc.	inc.
Type II Wave Pattern				
Normal	−22.3	0	2.5	24.0
Mild acidosis	3.0	0	1.4	−1.6
Severe acidosis	−7.4	0	1.1	1.8
Remark	.....	.....	inc.	.....
Type III Wave Pattern	.....	duration	....	.....
Normal	.....	0	1.0	0.5
Mild acidosis	.....	1.0	2.1	1.2
Severe acidosis	.....	14.0	0.3	2.3
Remark	.....	inc.	inc.	inc.
Percentage of Segmental Rhythmicity:				
	Proximal Segment		Distal Segment	
Normal	18.5		−0.6	
Mild acidosis	29.0		−1.6	
Severe acidosis	1.8		−8.2	
Remark	inc.		dec.	

* Showing the trend of change in the different parameters of the wave patterns in both the proximal and distal segments of the canine colon under conditions of normal and altered acid-base equilibrium and in response to the intramuscular injection of 0.25 mg. of mecholyl chloride.

† Type III waves are normally absent in severe acidosis.

variation was reduced markedly for both type II and type III contractions.

2. *Proximal colon during fully developed acidosis:* The direction of the effects of bentyl hydrochloride on the percentage incidence of type I and type II contractions was unchanged but was roughly five times more effective when acidosis was fully developed, to the severe stage. The reduction of the intraluminal pressure variation, although still present, was now only one-tenth as effective in type II and one-fifth in type III. Changes in rate and tone (for types I and II) and duration of type III waves were not marked.

3. *Distal colon during normal acid-base condition:* Under the normal acid-base condition bentyl hydrochloride decreases the incidence of type I contractions and increases that for type II. Only in type II was there a marked fall in intraluminal pressure variation. Other

TABLE III*

	Incidence (%)	Rate (per min.)	Tone (cm. H_2O)	Intraluminal Pressure Variation (cm. H_2O)
Proximal Segment:				
Type I Wave Pattern				
Normal	7.5	0	−2.0	0.2
Mild acidosis	32.5	0	−0.4	0.2
Severe acidosis	35.9	0.5	0.4	0.5
Remark	.....	.....	.....	inc.
Type II Wave Pattern				
Normal	−7.5	0	−0.5	48.3
Mild acidosis	−32.5	0	2.4	−1.0
Severe acidosis†	−35.9	−1.0	−3.8	−5.0
Remark	.....	.....	.....	dec.
Type III Wave Pattern	.....	duration	.....	.....
Normal	.....	0	−3.0	−23.5
Mild acidosis	.....	3.5	2.6	0.6
Severe acidosis‡	.....	−5.0	−1.5	−4.0
Remark	.....	.....	.....	.....
Distal Segment:				
Type I Wave Pattern				
Normal	−4.6	0	−6.0	−2.6
Mild acidosis	35.6	−1.0	0.5	0.5
Severe acidosis	−20.1	0	−1.2	0
Remark	.....	.....	.....	.....
Type II Wave Pattern				
Normal	4.6	0	−5.9	−26.4
Mild acidosis§	−35.6	−1.0	−3.4	−1.4
Severe acidosis	20.1	0	0.8	−1.8
Remark	.....	.....	.....	.....
Type III Wave Pattern	.....	duration	.....	.....
Normal	.....	−1.0	6.0	−0.5
Mild acidosis	.....	9.0	0.9	−1.7
Severe acidosis**	.....	−16.5	−3.3	−3.3
Remark	.....	.....	.....	dec.
Percentage of Segmental Rhythmicity:				
	Proximal Segment			Distal Segment
Normal	7.5		.....	1.8
Mild acidosis	47.7		.....	−14.6
Severe acidosis	−13.6		.....	10.1
Remark	.....		.....	.....

* Showing the trend of change in the different parameters of the wave patterns in both the proximal and distal segments of the canine colon under conditions of normal and altered acid-base equilibrium and in response to the intramuscular injection of bentyl hydrochloride (2 mg./kg. body weight) after a previous intramuscular injection of 0.25 mg. mecholyl chloride.

† Type II waves are suppressed in severe acidosis after injection of bentyl HCl, prox. seg.

‡ Type III waves, proximal segment are suppressed in severe acidosis after injection of bentyl hydrochloride.

§ Type II waves, distal segment, suppressed in mild acidosis after the injection of bentyl hydrochloride.

** Type III waves, distal segment, are suppressed in severe acidosis after injection of bentyl hydrochloride.

parameters measured did not show any outstanding changes.

4. *Distal colon during fully developed acidosis:* The direction of the effects of bentyl hydrochloride on the percentage incidence of type I and II contractions was unchanged but was five times more effective during acidosis. Intraluminal pressure variations were still reduced by bentyl hydrochloride in type II but the effects now were very small. Changes in other parameters measured were not outstanding except the duration of type III which was much shortened.

In the proximal colon the percentage of segmental rhythmicity was increased by bentyl hydrochloride under normal acid-base condi-

tion, but was much decreased during severe acidosis. In the distal segment the small increase of the percentage of segmental rhythmicity that followed the injection of bentyl hydrochloride during normal acid-base condition became a large increase during severe acidosis. This was especially true for type III contractions in the proximal segment; as severe acidosis developed, changes found at that time were frequently preceded by alterations in the opposite direction during mild acidosis. The percentage incidence of types I and II contractions in the distal segment and the percentage of segmental rhythmicity in both the proximal and distal segments showed similar changes.

TABLE IV*

	Incidence (%)	Rate (per min.)	Tone (cm. H_2O)	Intraluminal Pressure Variation (cm. H_2O)
Proximal Segment:				
Type I Wave Pattern				
Normal	2.0	−1.5	−1.0	−0.2
Mild acidosis	36.4	0	0.2	2.0
Severe acidosis	−69.4	−0.5	−0.7	−0.5
Remark	.....	.....	.....	.....
Type II Wave Pattern				
Normal	−2.0	0	−2.3	−2.0
Mild acidosis	−36.4	0	−3.3	−0.2
Severe acidosis	69.4	1.0	1.3	2.6
Remark	.....	.....	.....	.....
Type III Wave Pattern	.....	duration	.....	.....
Normal	.....	2.0	−2.0	11.5
Mild acidosis	.....	−11.0	2.0	1.0
Severe acidosis	.....	6.5	1.5	2.0
Remark	.....	.....	.....	.....
Distal Segment:				
Type I Wave Pattern				
Normal	29.6	−0.5	1.5	2.6
Mild acidosis	−50.6	0	2.6	0.8
Severe acidosis	−28.9	−0.5	2.4	−0.7
Remark	dec.	.....	inc.	.....
Type II Wave Pattern				
Normal	−29.6	0	1.1	3.4
Mild acidosis	50.6	1.0	4.0	4.0
Severe acidosis	28.9	0	−0.6	4.8
Remark	inc.	.....	.....	inc.
Type III Wave Pattern	.....	duration	.....	.....
Normal	.....	1.5	1.0	5.0
Mild acidosis	.....	−13.0	2.0	2.5
Severe acidosis	.....	10.0	1.5	3.0
Remark	.....	.....	inc.	inc.
Percentage of Segmental Rhythmicity:				
	Proximal Segment		Distal Segment	
Normal	−10.0		.....	−7.8
Mild acidosis	17.1		.....	39.6
Severe acidosis	39.9		.....	14.9
Remark	.....		.....	.....

* Showing the trend of change in the different parameters of the wave patterns in both the proximal and distal segments of the canine colon under conditions of normal and altered acid-base equilibrium and in response to the repeat intramuscular injection of 0.25 mg. mecholyl chloride, after a previous intramuscular injection of bentyl hydrochloride (2 mg/kg. body wt.)

Effect of Acetyl B-Methylcholine Chloride after Diethylaminoethyl l-Cyclohexylcyclohexane Carboxylate Hydrochloride (Table IV). 1. *Proximal colon during normal acid-base condition:* Mecholyl chloride under these circumstances produced insignificant effects except in intra-

luminal pressure variation of type III waves in which there was an increase.

2. *Proximal colon during fully developed acidosis:* Mecholyl chloride under these circumstances reversed the direction of the percentage incidence of types I and II contractions. Small increases in the normal dog were converted into large decreases for type I, and the small decreases in the normal dog being converted into large increases for type II. The duration of type III contractions was increased. Intraluminal pressure variation was still increased but to a lesser degree.

3. *Distal colon during normal acid-base condition:* Here mecholyl chloride increased the incidence of type I contractions but decreased that of type II. Other changes were not noteworthy.

4. *Distal colon during fully developed acidosis:* Here the reversal of the direction of incidence of segmental rhythmicity was spectacular. Type I contractions which increased approximately 30 per cent when mecholyl chloride was injected after bentyl hydrochloride under normal acid-base condition were decreased after similar injections once acidosis has developed. Type II contractions, decreased by about 30 per cent in the normal acid-base condition, were increased by an approximately equal amount. The duration of type III changes were increased more than in normal controls. The changes in the other parameters were not marked.

Mecholyl chloride in both the proximal and distal segments caused a decrease in the percentage of segmental rhythmicity. During acidosis these values were converted to increases. All segmental rhythmicities and the duration of type III contractions, changed in one direction during the stage of mild acidosis and into the opposite direction during the severe acidotic state.

COMMENTS

In these experiments there was a decrease in the spontaneous tone and intraluminal pressure variation developed with both types I and II contractions during acidosis. Mecholyl chloride, however, which increased tone and intraluminal pressure variation during normal acid-base condition, was much less effective when acidosis existed although it still acted in the same direction. These results are in agreement with experiments on isolated rabbit's small intestine, when at lower limits of an optimal range of pH spontaneous contraction and frequency are reduced with an increasing irregularity of the contraction pattern yet responses to acetylcholine persist.[8,9] Moreover, while there are not any qualitative changes in the percentage incidence of type I and type II contractions, mecholyl chloride is much less effective in the proximal segment, and somewhat less effective in the distal segment in producing changes in the incidence of these contractions.

Bentyl hydrochloride, inhibitory for tone and intraluminal pressure variations in type I and II contractions under normal acid-base condition in our experiments and in those of others,[22] has its ability to inhibit much reduced by the onset of acidosis. On the other hand, while changes in the incidence of types I and II contractions during acidosis are only quantitative and in the same direction as bentyl hydrochloride during normal acid-base condition, this drug was much more effective under these abnormal acid-base conditions in bringing about inhibition.

When mecholyl chloride is repeated after bentyl hydrochloride, the incidence of type II contractions (in both the proximal and distal segments) which are normally decreased, are increased during acidosis. The percentage incidence of type I contractions is also reversed. Mecholyl chloride after bentyl hydrochloride increases these during acidosis. In these groups of experiments the effects on tone and intraluminal pressure variation are not so marked.

Variations in the response between the proximal and distal segments of the canine colon, within any one segment under normal acid-base condition as compared to acidosis, and within any one segment to the same drug depending upon whether there is an alteration of the acid-base equilibrium or not, or whether the drug follows another drug or not, all serve to emphasize the point that many factors may alter the responses of smooth muscle.[4–11] This has been stressed in recent human studies.[17,31] Moreover, the opposite changes in several parameters in mild acidosis as compared to severe acidosis also indicate the same point. This is similar to the experiences of Mohammed and Bean with perfused small intestine in which a high blood pCO_2 increased rhythmic contractions of type I and tonus but later inhibited both. Anatomical location, acid-base

balance, muscle length and previous exposure to stimulating or inhibiting agents may all be considered as factors which condition the response of colonic smooth muscle in any set of circumstances under consideration. Mecholyl chloride, known to be an agent which stimulated generally[23,28,29] may actually be either less effective during acidosis or have reversed effects in acidosis when it follows an inhibitor like bentyl hydrochloride even though time has elapsed so that the effects of bentyl are not apparent any more.

Both mecholyl chloride and bentyl hydrochloride are less effective in producing changes in tone and intraluminal pressure variation in the acidotic state despite differences in the direction of their actions. As far as tone and intraluminal pressure variation are concerned, the depressing effects of acidosis seem to predominate over the stimulating or inhibiting activities of either mecholyl chloride or bentyl hydrochloride in changing these two parameters. The inhibitory effect of acidosis is expressed as reduced effectiveness on the parts of these two drugs. However, when the incidence of type I and II contractions are concerned, mecholyl chloride has a decreased effect and bentyl hydrochloride has an increased potency during acidosis, regardless of the direction (whether excitatory or inhibitory) of their actions. When the incidence of motility is concerned, the decreased effectiveness of mecholyl chloride during acidosis may represent the difference between two opposing influences, mecholyl chloride as excitatory and acidosis as inhibitory. On the other hand, the increased effectiveness of bentyl hydrochloride may represent the sum of two inhibitory influences, bentyl hydrochloride which is inhibitory and acidosis which is also inhibitory.

Types I and III have been clearly described as non-propulsive.[17] Our experiments have shown that in acidosis there is an increased incidence of type I contractions which would move the contents around without any propulsion. This is a possible explanation for the borborygmi heard. The decreased intraluminal pressure variation and tone in acidosis would also make transport less likely.

CONCLUSIONS

1. In acidosis the rate, tone and intraluminal pressure variation of types I and II contractions are reduced. The duration of type III contractions is shortened. The incidence of type II contractions is reduced but that of type I is increased.

2. Mecholyl chloride produces a marked increase in pressure in normal acid-base condition in type I and II contractions in the proximal segment of the canine colon, and to a lesser extent in type II contractions of the distal segment. During acidosis all these actions are in the same direction as in the normal controls but are less effective.

3. Bentyl hydrochloride caused a large decrease in the intraluminal pressure variations of types II and III contractions under normal acid-base condition in the proximal segment of the canine colon, and to a lesser extent in the distal segment. When acidosis was induced, the results of the administration of bentyl hydrochloride are in the same direction as in the normal controls but are much less effective.

4. The effects of mecholyl hydrochloride on the incidence of types I and II waves in both the proximal and distal segments of the canine colon during acidosis are qualitatively unchanged but are *less* effective.

5. The effects of bentyl hydrochloride on the incidence of types I and II contractions in both the proximal and distal segments of the canine colon during acidosis are qualitatively unchanged but are *more* effective.

6. When mecholyl chloride is repeated after bentyl hydrochloride during acidosis, the incidence of types I and II contractions is reversed.

7. The role of the anatomical situation (whether the proximal or distal segment of the canine colon), the acid-base condition, the administration of excitatory and inhibitory drugs during normal and acidotic states, and smooth muscle length are discussed in relation to the factors governing the varying responses of colon musculature. The possible relations to borborygmi which occur during acidosis are indicated.

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DISCUSSION

Morton J. Oppenheimer (Philadelphia, Pa.): It is an honor to have been selected to discuss before this session of the American Proctologic Society. It is a special privilege and pleasure to discuss Dr. Recio's paper. I would like to make two important points during my remarks in the time allowed.

First, Dr. Recio has used the latest technics for recording and has made a quantitative analysis of his motility records, as has been so well and strongly advised by Dr. Charles Code at the Mayo Clinic. The advantage of such an analysis is that the observer can put down the important features of a series of motility records in a small table. Thus a small group of numbers will give much more information than the tedious and discouraging examination of large numbers of records spread out on the surface of a table.

In this study it has been demonstrated that colonic tonus and pressure is decreased in acidosis. This means that many agents which formerly inhibited will now excite. Smooth or involuntary muscle tends to return to a middle or resting length. Thus with a dilated or relaxed muscle, many agents acting on it will make it contract; hence the importance of this observation.

Type I contractions which are known to be non-propulsive are increased and type II contractions are decreased; the latter are associated with haustral contractions. Increased type I (non-propulsive) and decreased type II (concerned with the haustral contractions) along with the decrease in tonus may explain the large amounts of borborygmi which are noted in acidosis in this experimental situation.

Next, Rice, Holman and Wolf have emphasized that responses of the human colon to drugs vary with the previous condition of the musculature. These previous conditions include the hydrogen ion concentration of the blood, the anatomic situations under study, that is, whether proximal or distal, and the previous stimulation or inhibition. This is of great importance to the proctologist since it explains the variable responses to any single agent, as was well emphasized by Dr. Recio.

To illustrate this, Dr. Recio has been able to show that mecholyl, which increases tonus and pressure in a normal individual, is much less effective in acidosis. It is also less effective in changing the incidence of motility, which is a different item entirely than pressure, regardless of the direction of change. On the other hand, when mecholyl follows bentyl, a relaxing agent, the incidence of several types of motility are actually reversed. Bentyl, on the other hand, which decreases tonus and pressure in a normal individual is less effective in acidosis.

As far as tonus is concerned, both mecholyl and bentyl are less effective in acidosis. However, bentyl is much more effective in altering the incidence of motility, that is, whether you will have activity or not regardless of its direction. Thus it would seem that the inhibitory effects of acidosis predominate over the inhibiting or stimulating effects of bentyl or mecholyl, and this is expressed as reduced effectiveness as far as tonus and pressure are concerned.

However, when the incidence of motility is examined, that is, whether you have activity or not, mecholyl is less effective and bentyl more effective during acidosis. Mecholyl, then, represents the difference between acidotic inhibition and drug stimulation, but bentyl is the sum of these two inhibiting factors. Therefore, it can be seen that tonus and pressure on the one hand and incidence of motility on the other must be sharply differentiated.

In closing, I would like to remind you also that even the depth of acidosis was shown to make a difference in response. It is fair to conclude then that the proctologist, like all other physicians, must regard the number of variables present in evaluating the responses that he obtains with any drug in any particular patient.

SURGICAL TREATMENT OF PROCIDENTIA OF THE RECTUM*

AN EVALUATION OF COMBINED ABDOMINAL AND PERINEAL REPAIR

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(By Invitation)

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TRUE prolapse or procidentia of the rectum continues to challenge the ingenuity of surgeons as evidenced by the variety of procedures which are being advocated for its correction.[1-6] Despite initial enthusiasm continued experience with each method usually discloses late recurrences or other shortcomings. The present report is concerned with the late results in sixteen patients treated by a radical perineal excision combined in most instances with an abdominal repair. This procedure was described in detail in 1948[7] and consists essentially of the following steps: *By the perineal route:* (1) circular amputation of the prolapsed rectum; (2) excision of any redundant hernial sac; (3) suture of the levator muscles anterior to the rectum; (4) anosigmoidal anastomosis. *By the abdominal route:* (1) mobilization of the pelvic colon; (2) excision of the pelvic peritoneum with suture of the transversalis fascia; (3) fixation of the pelvic colon to the lateral wall of the pelvis.

Several modifications of this procedure have been employed so that the results may be grouped under three headings: (1) cases in which radical perineal excision was the only procedure employed; (2) radical perineal excision combined with the abdominal operation as originally described; (3) perineal repair consisting only of suture of the levators and an abdominal operation consisting of mobilization of the pelvic colon, excision of redundant peritoneum, reconstruction of the pelvic floor and a Mikulicz resection of the redundant pelvic colon. This operation embodies the same steps as the original procedure but avoids the resection of the lower rectum.

RESULTS

Radical Perineal Excision. There were three patients in this group. The abdominal portion of the repair was omitted because of the advanced age of the patient in one instance and in two cases the patients felt so well following the first stage operation that they requested postponement of the second stage. The initial results in these cases were excellent as regards correction of prolapse and return of good sphincter tone. Continence was "satisfactory" and comparable to that seen following the combined operation. It will be discussed in some detail later. One patient was an elderly woman with heart disease who has been quite inactive since operation. There has been no recurrence of the prolapse in this instance. In the other two patients, however, slight redundancy of the rectal mucosa and bulging of the perineum anteriorly developed within three months and in both instances the abdominal repair was then performed. These two cases are subsequently considered in the group of combined operations. Because of these threatened recurrences in two of the patients we have thought it wise to reserve perineal excision alone for poor risk patients. It is of considerable interest, therefore, that Altemeier[1] has carried out essentially the same procedure but with excision of a larger segment of colon and has reported very satisfactory results in a series of nine cases. The only difference between Altemeier's procedure and the operation as originally described is his effort to excise as much redundant colon as can be delivered through the perineal excision. The excellence of his results indicate that if one elects to do the perineal excision alone, one should carry out the more extensive bowel resection.

The advantages of the perineal excision as we have seen it are: (1) It is well tolerated by the patients even when there is considerable loss of blood. (2) The immediate postoperative results compare favorably with that of the

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combined excision so that it is an appropriate procedure for the elderly sedentary or bedridden patient who is not a good risk for an abdominal operation. (3) The results of Altemeier indicate that with excision of a large amount of colon better long-term results can be obtained than we have expected. The disadvantages, however, of the perineal excision are: (1) It is a bloody and technically a somewhat difficult operation. (2) It removes the rectum and interferes with the anorectal, reflexes (*vide infra*). (3) In our hands, at least there seem to be a higher incidence of recurrences than one would hope to see following so extensive an operation.

Combined Abdominal Perineal Excision as Orignally Described.[7] The procedure as originally described has been performed in twelve instances including the two patients in whom partial recurrence developed following perineal excision alone and who were then subjected to an abdominal repair. Follow-up has been available in all cases and in general the results have been very gratifying. There have been no complete recurrences, but one patient has considerable mucosal eversion and is incontinent.

The chief objections to this procedure have been the following: (1) The perineal operation is often bloody and prolonged so that in the elderly patient the abdominal phase must be performed as a separate procedure. (2) The operation removes the rectum and interferes with the anorectal reflexes. (3) Postoperative infection, abscesses and stricture may develop at the suture line. There have been three instances of major local infection with stenosis. Although these have all responded to treatment without the development of permanent stricture, morbidity is greatly increased under these circumstances. (4) Continence is impaired to a variable degree. It is difficult to evaluate because in all instances the patients are better off than they were prior to the repair and they do not complain of incontinence as a presenting problem. This is particularly true of patients in whom there has been long-standing prolapse with marked weakening and fraying of the levator muscles and the constant presence of a perineal protrusion. In a careful evaluation of these patients, however, one finds that as long as the bowel movements are solid and are passed at regular intervals there is no difficulty with continence. However, some of these patients do not retain gas well and, faced with the necessity of holding liquid feces in the rectum, they cannot do so normally. The reflex tone of the muscle seems to be impaired.

A study of the effects of perineal excision of the prolapsed rectum on the anorectal reflexes is in progress and will be reported in detail subsequently.[8] The results are somewhat variable. Young, vigorous patients who have had prolapse for a comparatively short time seem to have less difficulty with incontinence than older patients who come to operation with markedly weakened and frayed anal musculature. Some of the patients in the younger age group appear to have no functional incontinence. They have no leakage of feces, no staining of underclothing and only slight difficulty in holding a bowel movement during an urgent urge to defecate. Yet we cannot demonstrate a reflex contracture of the external anal sphincter in response to stimulation of the rectum as described by Gaston.[9] A voluntary contracture at the conscious level occurs but is not maintained. Moreover, these patients have a normal sense of fullness in the rectum and defecate normally. Other patients in whom the same operation was performed have difficulty in holding liquid feces and cannot control gas or an urgent desire to defecate effectively. Yet they have a sensation warning them of feces in the rectum. Barring occasional accidents associated with diarrhea, they get along moderately well. In other words, this operation, although it excises 15 to 20 cm. of rectum and leaves no more than a centimeter or two of mucosa proximal to the anal canal, does not result in an anal colostomy. These patients appear to be much more normal as regards anorectal function than patients who have had a resection of the rectum with preservation of the sphincter for carcinoma. In fact we have encountered much more incontinence in one patient who had a very extensive anterior resection leaving only about 8 cm. of rectum than we have seen in any of the patients with partial excision for prolapse.

There are several possible explanations. In general less bowel is excised in operations for prolapse, but most important we believe the nerve supply to the bowel is not noticeably affected. So long as the major nervous pathways are intact, excision of the rectum alone does not seem to produce total loss of anorectal function. It affects it adversely and may destroy reflex contraction of the external anal

sphincter but compensatory changes seem to prevent total incontinence.[8]

Combined Abdominal Perineal Repair of Rectal Prolapse with Resection of the Bowel and Peritoneal Sac by the Abdominal Route. The technical details of this procedure consist of the following: An incision is made anterior to the rectum opening the perineum much as one does in a perineorrhaphy in the female. The anterior wall of the redundant rectum is identified and together with the peritoneal sac is pushed upward as far as possible. The anterior rectal wall is then pushed downward with the fingers and the frayed out levator muscles sutured anterior to it with one, two or three sutures of moderately heavy catgut. This is a relatively simple, comparatively bloodless procedure. It can be done quickly. The patient is then placed in the Trendelenburg position, and through an abdominal approach the pelvic colon and pelvic peritoneum are completely mobilized. The redundant pelvic colon is resected by means of a Mikulicz procedure. If there is comparatively little redundancy of the colon, it is fixed to the pelvic parietes by sutures of fine silk. Essential steps in this procedure, however, consist of excision of the pelvic peritoneum including the redundant peritoneum which forms the hernial sac and closure of the transversalis fascia anterior to the rectum. A new pelvic floor is constructed at a higher level. This procedure has been done in two cases and despite our limited experience we are encouraged to employ it more frequently. It has the following advantages: The perineal operation is a clean one with no contamination. It is technically easy, not particularly bloody and can be done expeditiously. There is no risk of local abscess formation or stricture since there is no anastomosis at this point. The anorectal reflexes remain intact. The abdominal repair is somewhat more extensive than in the original procedure but is tolerated fully as well. By using the Mikulicz approach contamination of the peritoneal cavity for a benign lesion is avoided and additional fixation of the bowel obtained.

The disadvantages of this procedure rest with the inherent tendency of the redundant rectal mucosa to slide and prolapse through the anal canal postoperatively. Despite an excellent fixation of the pelvic colon and complete obliteration of the hernial sac, there is still sufficient loose mucosa so that it seems to slide through the anal sphincter and give the patient a sensation of prolapse comparable to that seen in prolapsing hemorrhoids. This has been dealt with by injection of sclerosing solution in one case. In the second case at the time of operation the rectal mucosa was cauterized in a radial fashion, but despite this there was still some tendency to prolapse which required postoperative injection.

SUMMARY

The end results in sixteen operations for procidentia of the rectum have been presented. Three procedures, all modifications of a radical perineal operation described originally in 1948, have been employed. The advantages and disadvantages of each have been presented in detail. Although there has been only one recurrence, none of these procedures have produced a totally and completely satisfactory repair of rectal prolapse in every case. At the present time we are continuing to use abdominal perineal repair employing a limited perineal excision consisting only of mobilization of the rectum and suture of the levators anterior to it and a more extensive abdominal operation. It is our belief, at the present time, that of all the various measures recommended for the repair of rectal prolapse this represents the most anatomic and physiologic.

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Symposium on Ulcerative Colitis

MEDICAL ASPECTS OF CHRONIC ULCERATIVE COLITIS*

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TO talk on ulcerative colitis as a medical man before a group of surgeons is a little bit like being on the defensive, but it may be proper to try to discuss the condition from the point of view of the whole disease and leave the surgeons who follow me a target to shoot at.

What I have to say will not be very new but it may put things into a proper sequence, at least as I have seen them over the last thirty years or more.

Ulcerative colitis is obviously a chronic disease which has a very definite tendency to recur. I believe that the disease is incurable. I think it is improper and unfair to say that any case has ever been cured in the true sense of the word, even though a patient does extremely well, because under proper circumstances the patient is always vulnerable and may have a recurrence at any time. The disease of course is curable surgically, and I think one of the questions that will be discussed is, When is surgery justified and how frequently?

The disease occurs at any age in life. Certainly we have seen patients at four, five and six years of age, and we have seen the disease start in patients at the age of seventy or more. The main incidence of the disease is in the late teens or early twenties. It is distributed equally between males and females. The type of individual, I think, is of a good deal of importance. Psychiatrists have tried to classify the patients as to psychic types. I think that is impossible. However, it is fair to say that there are very few patients with chronic idiopathic ulcerative colitis who do not present a very important psychic element; and unless this can be adequately controlled or helped, it is usually impossible to control the disease satisfactorily as a medical problem.

The cause of the disease, as its name implies, is not known. It is truly idiopathic and, unlike amebic dysentery or tubercular ulcerative colitis, we are still searching for what may be the initiating cause. By the time the diagnosis is made, however, I think it is fair to say that there may be many elements which prolong the disease or which cause recurrences, bacterial or viral in nature. They are not the cause of the disease. My own impression is that the disease occurs as a rule in an individual who is an extremely reactive, rather shut-in person who is exposed to serious infection or trauma of some sort. Sometimes it is serious emotional trauma; sometimes it is as simple as acute bacillary dysentery. At any rate, one of these causes starts it off and for some reason not understood the disease then keeps going.

The usual case is characterized by episodes in which there may be a moderately acute or fairly acute onset, a progression, then subsidence of the disease, a period free from symptoms and then recurrences from time to time. There recurrences come at frequent intervals or possibly after intervals of several years if the patient is under good control.

It may occur as a fulminating disease with no demonstrable organism that initiates the attack, with death in five or six weeks. It may continue as a steady disease that goes along with minor ups and downs but progresses over a long period of time, finally causing more and more destruction of the normal structure of the colon. In most instances the disease starts in the rectum and progresses toward the ileocecal valve but does not pass it. In a small percentage of cases it may be present in the transverse colon only or in the ascending or descending colon only, but this constitutes a relatively small proportion of cases.

Also, occasionally the disease may pass

*The four papers comprising the Symposium on Ulcerative Colitis were delivered extemporaneously at the meeting of the Society, hence the pleasant informality of these presentations.

beyond the ileocecal valve and involve the ileum. Fortunately, this also is quite uncommon and is not to be expected, although we have to look for it especially when we consider progress of the disease and the question of proper surgery.

The factors that bring about relapses in a given case as a rule are clear. They may involve pregnancy. They may involve emotional or physical trauma such as a serious accident, intercurrent infection or gross dietary indiscretions. It is a curious thing, however, that in this disease, as in peptic ulcer, gross dietary discretions at times are tolerated perfectly well if other parts of the picture are under good control and the patient is well relaxed.

The disease is early characterized by submucosal pinpoint lesions with superficial erosion and then ulceration and healing if things go well. Perforation may occur—fortunately, this is uncommon. It is quite rare to have frank perforation presented as a surgical emergency.

The disease may involve so much of the bowel wall that it is a true cellulitis, or it may be so superficial that it can be demonstrated only by very careful observation with the sigmoidoscope and may not be seen by careful and excellent radiologic study. Fibrosis and narrowing of the gut are later manifestations.

The complications of the disease are well known. Those related to the bowel itself are obvious, perforation being one of the most serious. If there is a tendency to perforate, as a rule there is also a tendency to wall off.

Hemorrhage, of course, and by that I mean gross hemorrhage rather than streaking or moderate bleeding, is a serious complication and may endanger life. Stricture may form as the disease progresses. Fibrous tissue replaces normal bowel structure and we may have focal stricture or narrowed areas all up and down the line. Another type of complication directly related to the colon is extremely important because it may be the presenting source of symptoms for which the patient comes to the doctor. I refer to perianal sepsis, fissures, rectovaginal fistula and others, all of these things may occur as direct complications of the disease in the lower part of the bowel, that is, in the rectal and rectosigmoidal sector. I should also mention the occasional one of periurethral infection with abscess formation, actually causing necrosis throughout the tissues, along the entire length of the urethra.

A different type of complication is also important. Probably the most common is involvement of the joints. Joint involvement, which is indistinguishable from rheumatoid arthritis, occurs in 10 per cent of the cases and rarely may precede the bowel symptoms. This is a curious phenomenon but perfectly well known by those who see a good deal of the disease. It is an important complication because it causes further crippling and in itself it may be an indication for surgery. I hope Dr. Cattell will forgive me if I mention one or two things that as a medical man I think indicate the need for surgery in individual cases. Progressive crippling joint disease may be one. However, one cannot always be sure that adequate surgery, which means total colectomy, will necessarily stop the progress of the joint disease although it frequently does.

Skin complications are common. Anything from pustules with non-specific cultures to erythema nodosum is quite common. A rare condition, necrotizing lesions as large as a silver dollar or even larger that cause fairly deep necrosis of the skin and subcutaneous tissue, again with negative cultures, is an interesting and serious problem that one has to face occasionally in these patients with ulcerative colitis.

Involvement of the eye occurs, and it is always serious. It may be so-called rheumatoid or rheumatic in nature, or "tubercular." It has nothing to do with tuberculosis or with rheumatoid disease but it has the general gross characteristics of the disease. It may cause destruction of the eye itself or it may cause blindness without destruction of the eye. It is a very serious complication and in itself is an immediate indication for radical surgery.

Renal calculi may occur in a certain number of these patients, I presume due to two factors: (1) dehydration from chronic diarrhea and (2) because these patients may have been kept in bed for a long time and therefore have decalcification of the bones, excessive amounts of calcium in the urine and the formation of calcium phosphate calculi. Uric acid stones have also been found. They may present the symptom of abdominal or flank pain and may be overlooked because of the existing colitis.

Cirrhosis of the liver appears to be another

complication; this is not common. In the long drawn-out case one should expect to find an enlarged liver, which usually is a fatty liver. This condition is common. One should expect to find a palpable spleen on careful palpation. That in itself is merely a reflection of the disease process and its duration.

In addition, one may encounter true cirrhosis, or fibrosis of the liver, probably on a nutritional basis. However, the pathologic description of the changes in the liver is not always the same; I would prefer to say that we get cirrhosis of the liver and it is not always the same type. It is a very serious complication because it reflects the degree of the disease, and the wasting and malnutrition which accompany it. It renders surgery much more hazardous and of dubious outcome.

A curious complication that is very common is clubbing of the fingers in the long drawn-out cases. It is completely reversible in most instances if clinical improvement occurs.

Liver abscess should be common, but I have seen only one in thirty years. Endocarditis and septicemia occur sometimes.

Finally we get functional disturbances as shown by the development of amenorrhea and other endocrine disorders, presumably on the basis of long-continued malnutrition. I should mention avitaminosis with its various manifestations. Obviously, this disease presents many facets and challenges to the medical profession as a whole. It is not a medical or surgical disease, or a psychiatric problem. It is the sort of disease that challenges the entire profession and must involve teamwork between various members of the profession working together and frequently supplementing each other in making decisions or doing the right thing at the right time.

When it comes to the acute phase of the disease I should mention one other thing which may endanger life very rapidly, in addition to hemorrhage, and that is loss of fluid and electrolyte imbalance. Not infrequently we get serious depletion in sodium, potassium and chloride, enough so that the patient may go into shock or die if the levels are not restored quite rapidly.

The diagnosis should as a rule be made with ease. Diarrhea is not always present. Sometimes there is constipation. The patient's past history should be of value. Physical examination may or may not help, but as a rule one can find a palpable sigmoid which is tender. In the more serious cases one can find local signs in the abdomen. It is extremely important not only to diagnose the disease but also to judge the disease, to demonstrate to yourself how severe the degree of malnutrition is, because that will color the planning of the treatment, i.e., preparation for surgery if it is indicated, or the decision to treat only medically.

The most important means of making a diagnosis is adequate sigmoidoscopy, and it is perfectly ridiculous for me to say anything about that to this group. I will merely point out one fact and I imagine I will get complete approval. It is that many men in using a sigmoidoscope do not wipe the mucosa adequately and therefore at times can miss the diagnosis. I have seen this done by myself, by other medical men and by surgeons. The disease can be so superficial that the mucous exudate over the lesions can cover them to the extent that everything looks normal and the disease may not be diagnosed. Nevertheless, sigmoidoscopy will make the diagnosis in the vast majority of cases. X-ray, of course, is the other diagnostic measure.

I am not interested in the advanced case. It is important to make an early diagnosis and get the individual under control. Sigmoidoscopic appearance in the early case is important. There is a friable mucosa which bleeds easily and in which there are punctate areas of what must be capillary loop hemorrhage. There may be no ulcerations, however. This is the early stage of the disease; and while there may be much more advanced stages in the colon beyond the region of the sigmoidoscope, one can usually get a decent estimate of the disease right in the rectum and rectosigmoid. No patient, to my mind, is too sick to undergo sigmoidoscopy unless he has a very painful fissure or perianal sepsis. Usually by employing a smaller sigmoidoscope and gentle manipulation one can do it perfectly easily. If the patient is very sick, one can put him in Sims' position and take all the time necessary to explore the entire field.

Early x-ray findings are just beginning to be appreciated. We used to look for deep ulceration, for a change in mucosal pattern, for polyp formation and so on. Those are later changes. The early diagnostic signs in x-ray are fine, tiny serrations that can hardly be made out. They will usually be found in the sigmoid and from

there up; they may be limited only to the sigmoid.

Most of the x-ray findings are perfectly well known, but I want to stress the importance of the very early ones. It is even permissible to use a hand lens to pick out these little serrations with the x-ray man and have him say, "These are not little contractions, but these are true erosions in the mucosa."

The treatment of ulcerative colitis involves a program that should cover an indefinite period of time. Nutrition is important; and if the patient is malnourished, a proper diet is given with adequate calories, with or without vitamins. Probably vitamins do very little good except for obvious deficits provided the diet is adequate. An adequate diet is needed, remembering always that there is wastage. Therefore, if you give a dollar's worth of food and the patient needs a dollar's worth because he is wasting perhaps one-quarter, you must give a little bit more. It means non-bulky food, a concentrated diet for the most part, if the patient will take it. Obviously, rough foods should be avoided as well as irritating foods.

Relaxation either by means of persuasion by the doctor, gentle handling of the patient, avoidance of irritating situations and the occasional use of sedation are very helpful and at times are necessary. The use of barbiturates either by mouth or subcutaneously in acute instances sometimes decides whether the patients will relax and overcome their extreme tension or not. Atropine and its derivates may have some place but they do not solve anything; they merely help the situation.

Local treatment of the disease by irrigations I think has properly been given up for many years. Patients with mild cases occasionally may get relief, if the disease is sharply localized, by the instillation of warm cod liver oil as a retention enema. This is very soothing but is of value in only a few cases. It is in no way definitive treatment.

The use of drugs to cure the disease is useless. No drug cures the disease according to our present knowledge or lack of it. If there is fever, I think the sulfa drugs are probably still the best. They are less likely to give the troubles which we are now encountering with the various newer antibiotics.

I would say that if there is moderate elevation of temperature sulfadiazine in adequate dosage to produce a blood level of about 10 mg. per cent would probably be the most helpful, and this will fail in a great many instances. It will also help in a good number of cases, and one may shift over from it to one of the less absorbable sulfa drugs while carrying on, possibly keeping the patient on this therapy for some time. In instances in which the disease is mild recurrences can be handled sometimes by having the patient start immediately with sulfadiazine rather than aureomycin or terramycin (both of which can cause membranous colitis) or chloramphenicol.

It is fair to say that none of the newer drugs involved have provided the answer to the problem. Where one does not work it is all right to use another, always remembering that the so-called antibiotics may cause more trouble than they do good.

Replacement therapy is indicated; transfusions, albumin if this is very low, adequate diet and vitamins are all useful.

Overenthusiasm may get you into trouble. A mild case may be made severe by the too enthusiastic use of opium, barbiturates, aluminum hydroxide and atropine, to name four. One patient had been treated with a tremendous amount of enthusiasm very quickly in the first few days and it was seen that the bowel was full of large scybalous masses. When we finally delivered these, it was obvious that they were concretions. Peristalsis had been cut down by the use of too much barbiturate, opium, aluminum hydroxide, etc., and we got into real difficulties. The only way we got the masses out safely was to give a barium enema. With good medical measures, the appearance of the bowel returned to a fairly normal condition.

Regarding pregnancy, if this has been planned, whether or not there has been previous surgery and even though ileostomy has been performed, the pregnancy as a rule is well tolerated. However, if the pregnancy is not desired or is unexpected, the patient usually does very badly. The ulcerative colitis may become reactivated and even if the pregnancy is interrupted, which might be necessary, the attack may be serious. This is a curious fact which has been noted by various obstetricians and many of us on the medical side. Where the pregnancy is really planned and desired, most of the patients go through pregnancy all right; but after delivery there is danger of relapse unless one is careful.

What about the corticosteroids? They have been used for ulcerative colitis just the same as they have been used for everything else. They do not cure the disease and under no condition should they be employed with that idea in view. They do, at times, get one over a very serious difficulty where the patient is dangerously ill from an acute flare-up of the disease. One runs the risk of perforation and this danger must always be considered. Actually the use of steroids at times will reduce fever, bowel activity, pain and distention, and the patient may come safely through a critical period so that he may then be treated subsequently either by medical means or planned surgery.

Used with care either ACTH or cortisone can be really helpful. I believe that the corticosteroids have no real place in the chronic disease with fibrosis and destruction of normal bowel. The danger is greater than the benefit and they do not cure the disease in any case.

I know Dr. Cattell is going to tell us when to operate, but as a medical man I must make the decision once in a while. I would say there might be two reasons in the main. One is to save life. If you operate to save the patient's life, I think it is a reflection on the medical man who has waited too long and let the patient get into a very dangerous condition. The decision should have been made before that, except in the very occasional fulminating case progressing very steadily toward an obviously fatal outcome, with a great deal of distention, abdominal tenderness, fever, etc. An ileostomy may save life but its price is very high and its danger may be just as great as the danger of waiting.

Dr. Cattell or Dr. McKittrick, I believe, will comment on that without any doubt; but I suspect if we had to make the choice today, such a case is better treated with ACTH intravenously, hoping to check the attack and then deciding what to do next.

Otherwise it seems to me that an operation should be performed to rehabilitate a patient and make him a useful citizen. When the disease progresses so that a patient is of very little value to himself or his family, it is perfectly obvious to me that he should be operated upon, and it is a mistake to try to wait longer hoping that the tide will turn. It will not turn.

Operation should not be performed before puberty if it can be avoided. It is much better to let the patient reach maturity if possible.

Finally, severe arthritis or keratitis or serious perianal sepsis may be indications. I am sure Dr. Cattell will discuss those.

SURGICAL ASPECTS OF CHRONIC ULCERATIVE COLITIS*

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THE management of patients with chronic ulcerative colitis is a complicated clinical problem and it is the purpose of this symposium to present the present day experiences based on the treatment of patients with this disease observed for a long period of time. My purpose will be to present the surgical aspects of chronic ulcerative colitis exclusive of the care of the ileostomy which will be given by Dr. Turnbull. The surgical experiences that I will outline represent the combined efforts of the general surgical staff of the Lahey Clinic.

We are quite indebted to Dr. Jones for outlining the important medical aspects of ulcerative colitis. He failed to do one thing, and that was to tell us the cause of the disease. It is unfortunate that we do not know the etiology of this condition because all medical and surgical treatment in the absence of this knowledge must be empirical and must be supportive rather than specific in nature.

The present day surgical treatment of ulcerative colitis has gradually evolved as the result of failures and successes after the employment of a variety of surgical procedures. Satisfactory surgical treatment has been delayed by a number of attitudes and concepts. One of the greatest causes of failure lies in the fact that there has been a failure to accept surgery because of the necessity in nearly all cases of having a permanent ileostomy. Even when ileostomy is accepted, there has frequently been such delay that the morbidity and mortality following the procedure have been excessive. The mortality has also been contributed to by the employment of a too extensive surgical procedure in poor risk patients when ileostomy has been combined with colectomy. The delay in the acceptance of surgery has partially been due to the fact that satisfactory care of an ileostomy has been slowly developed. Fortunately, in this symposium Dr. Turnbull will present the important points in the construction of a satisfactory ileostomy and will particularly emphasize its proper subsequent care. It must be admitted by surgeons with experience in the treatment of ulcerative colitis that even the most carefully planned operative procedures will still be followed by an appreciable surgical mortality and by early and late complications. Fortunately, as we will later point out, these have been appreciably reduced and do not greatly exceed the complications and mortality following major procedures in even less debilitated patients.

In spite of the fact that the etiology of ulcerative colitis is unknown, some idea as to how it develops and spreads is essential in planning surgical treatment. I have previously stated that in my opinion ulcerative colitis may develop in any patient in whom there is a break in the integrity of the intestinal mucosa which does not heal promptly and which results in a secondary bacterial invasion of the bowel wall. Dr. Jones pointed out that the disease usually begins in the rectum and spreads throughout all layers of the bowel wall both proximally and distally. This is particularly important from the surgical point of view, since the rectum is usually the portion of the large intestine that is most involved and therefore can rarely be saved. In view of the fact that the disease progresses by direct continuity along the bowel wall, if a segmental type of operation is to be done, the surgeon must be certain that the amount of bowel removed includes all that is involved at that time. The degree of involvement is very difficult to determine by any means. The extent and severity of the disease is usually determined by sigmoidoscopic examination and by radiographic visualization as outlined by Dr. Jones. It is well recognized now that one cannot determine the full extent of the disease by these measures nor can the surgeon, by palpation or inspection of the colon at the time of operation, determine the limits of involvement. This fact is substantiated by the finding that partial or segmental resections of the colon for ulcerative colitis are

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usually followed by recurrence or persistence of the disease. In our own experience with a considerable number of segmental operations we have followed the principle that one should go 12 inches beyond any demonstrable involvement, but even with this conservative approach our own recurrence rate following segmental resection has been so high that at present we favor total removal of the colon when ileostomy has been necessary.

The surgical treatment of ulcerative colitis is based on two methods of alleviation or cure of the disease. The first is to put the bowel at rest by diversion of the fecal stream. One of the essential points in medical treatment is quite similar in that by dietary means and by bedrest the function of the colon is reduced. Ileostomy, or rarely a colostomy in the segmental form of the disease, is usually necessary to accomplish this first means of alleviating the disease. The second method employed is to remove the infected portion of the bowel by subtotal or total colectomy. The latter will be required in nearly all patients in whom surgical treatment is instituted. Dr. Jones made one point that impressed me very much and with which I am in complete agreement, namely, that a patient who has had ulcerative colitis can never be cured by medical means. Complete remission of symptoms may occur for varying periods of time but there is always a residual change in the bowel and there may be recurrent infection in the colon at any time but this infection is particularly apt to recur following some other intercurrent infection.

I would like to put particular emphasis on the fact that cooperative management of patients with ulcerative colitis is essential. All patients with ulcerative colitis should be under the care of an internist or gastroenterologist who should have their direction of treatment. I am sure that the clinics represented in this panel with Dr. McKittrick and Dr. Jones of the Massachusetts General Hospital, Dr. Turnbull and Dr. Collins from the Cleveland Clinic and our group at the Lahey Clinic all believe that this cooperative management is necessary for the best care of patients with ulcerative colitis. The point that I would like to emphasize is that early surgical consultation should be obtained so that there is a proper balance between medical and surgical treatment from the beginning of the management of patients with ulcerative colitis. Similarly, it is important that medical direction be continued during and after the postoperative period to aid in the rehabilitation of these patients. In many clinics it is thought essential to have a psychiatrist associated with their care from the beginning, but it is my personal view that such aid will be more useful during the postoperative period than as an integral part of the medical treatment.

In our clinic in an early report by Kiefer, of our gastroenterologic department, approximately 30 per cent of patients with ulcerative colitis were being submitted to surgery. However, as these early patients were followed for longer periods of time, up to ten or fifteen years, the percentage of patients requiring surgical intervention definitely increased so that today in our clinic in a large series of patients with chronic ulcerative colitis, many of whom have been followed for longer periods of time, surgical intervention has been employed in approximately 50 per cent.

The actual time in the course of the disease that surgery should be elected is impossible to state. Perhaps the greatest difference of opinion between surgeons interested in this problem and the medical group is in the patients with acute fulminating ulcerative colitis. This difference of opinion is understandable since all of us have observed patients whose acute symptoms were so severe that death seemed imminent and yet they recovered under medical measures with little trace of the disease left and without symptoms. This infrequent observation has resulted in too great a delay of the acceptance of surgery in cases of acute ulcerative colitis, with a resultant high mortality. In our practice we have thought it necessary to accept the fact that if a patient with acute fulminating colitis does not respond satisfactorily to medical measures within five to seven days, ileostomy must be done. If, as is occasionally observed, the patient is in extremely poor condition, the ileostomy may be done up to twenty-four to thirty-six hours during which time fluids and blood are given. Under these circumstances a loop is brought out under local anesthesia and decompressed by a catheter. When an ileostomy is done under these circumstances, it is always necessary to revise it later.

Dr. Jones referred to the use of ACTH and cortisone. His experience is similar to that reported by Kiefer and his associates from our clinic. There has now been sufficient time to

evaluate its use and on the basis of our experience we do not use it as a prolonged treatment for chronic ulcerative colitis but believe that its use should be confined to a short period for preparation for operation.

There are certain principles in the operative management of patients with ulcerative colitis that are of practical importance. General abdominal exploration in patients with ulcerative colitis is usually unwise, particularly in the patient with malnutrition and high fever. The surgical procedure should be confined to ileostomy alone. Generalized peritonitis may readily follow thorough abdominal exploration in these cases. In the performance of ileostomy it is, of course, necessary to identify the proper site for the stoma; usually the appendix will be visualized and, as in all cases of terminal ileitis, it will be involved, simulating acute appendicitis. It is important in all these cases not to disturb the appendix since it is impossible to deal with the appendix stump without the danger of infection or fistula. There is no general agreement relative to dealing with the rectal segment. Some surgeons still retain the hope that the right rectal segment may later be used for anastomosis of the ileum, with restoration of continuity of the bowel. Some retain the false hope that complete remission of the disease in the rectal segment can occur after an appreciable interval. A number of surgeons have employed dilatation of contracted right rectal segments followed by this anastomosis. It is our belief that any procedure of this sort is unwise and doomed to failure. It is for this reason that we recommend when colectomy is necessary for ulcerative colitis that the subsequent procedure of abdominoperineal resection be done. We further recommend in segmental resections for ulcerative colitis that the normal ileum not be anastomosed to bowel that has previously been involved with ulcerative colitis. After a considerable experience with this method in former years which was followed by reactivation of the disease, fistulas and a poorly functioning bowel, we believe that any other course than total colectomy is unwise.

The indications for surgical intervention for ulcerative colitis are now well recognized. Most of them have been mentioned by Dr. Jones. I have previously mentioned patients with acute fulminating colitis. In our experience we think that the safest course is to do early ileostomy in these cases. Massive hemorrhage is a rare indication, but chronic blood loss, even after ileostomy is performed, may necessitate resection at any time. In rare instances colectomy will be the only means of saving life when hemorrhage cannot be controlled. When fistulas or sinuses have developed, particularly in the region of the bladder, vagina or perineum, local operations are of no value and colectomy will be required. No operative procedure in the anorectal region should be done in patients with ulcerative colitis except the drainage of perirectal or ischiorectal abscesses. Operations for fistula-in-ano in the presence of ulcerative colitis result in an open wound and frequently incontinence of the sphincter. Some patients have an uncontrollable infectious arthritis; and if it is permitted to continue, permanent joint change and disability may result. In these patients ileostomy and total colectomy become mandatory. In a few patients in whom remission of the disease may occur obstruction will develop. Similarly, obstruction of the colon may follow ileostomy. It is for this reason that the proximal end of the distal loop of bowel in partial colectomy should be brought outside of the abdominal wall.

The important complication of malignant degeneration in long-standing ulcerative colitis has been well illustrated and presented by Dr. Buie and his associates at the Mayo Clinic. They have reported over 110 patients with carcinomatous degeneration in ulcerative colitis. Most of us have seen a considerable number of patients with this unfortunate complication. As we have previously pointed out, malignant degeneration will occur in approximately one-third of patients who have had the disease over ten years. In a recent report from St. Mark's Hospital by Mr. Gabriel, the incidence of malignant degeneration of all operative cases was 11.1 per cent and of these, 35 per cent had had the disease over twelve years. If it is true that the danger of malignant degeneration of patients with long-standing ulcerative colitis is as great as is now believed, we must accept this indication for a total colectomy in this group of patients.

It is admitted by all physicians with experience in the treatment of ulcerative colitis that a considerable proportion of all cases followed for an appreciable time will have an unsatisfactory result following medical treatment. These are termed the intractable cases and the

only possibility of these patients regaining their health is by ileostomy and total colectomy.

From 1928 to 1952, 871 patients with chronic ulcerative colitis were treated at the Lahey Clinic. Of this number, 413 were operated upon and a total of 858 operations performed. Previous to 1946, 194 patients were operated upon, with a 22.2 per cent mortality. Following ileostomy alone the mortality of this period was approximately 18 per cent.

There has been a decided improvement in mortality in more recent years. From 1947 to 1952, a period of six years, 219 patients were operated upon, with a patient mortality of 5 per cent. Five hundred forty-five operations on these 219 patients were done, with an operative procedure mortality of 2 per cent. The mortality of ileostomy has been greatly reduced. Three hundred fifty-five patients in the group of 431 patients operated upon had ileostomy performed. Seventy-six patients had either segmental colectomy with anastomosis or colostomy. The mortality following ileostomy up to 1946, as previously stated, was 18 per cent and since 1947 has been reduced to 4.3 per cent.

At this time I would like to make a comment relative to the combination of ileostomy and colectomy as a single and initial procedure. I should like to call attention to dangers that may be encountered or may follow this combined procedure. From 1935 to 1940, we found that the operative mortality was double that of ileostomy alone during that period. Since that time the use of many adjuvants to treatment has indicated that more patients might be safely submitted to the combined procedure. As you know Miller, Crile, Bacon, Weinstein, Ravitch and others have strongly urged the combination of ileostomy and colectomy as a single procedure. Because of our personal experience with it we would like to urge that carefully spaced stage procedures of ileostomy, colectomy and finally abdominoperineal resection can be done more safely.

In the past six years 189 total colectomies have been done. In our previous experience ileostomy was performed as a sole procedure in many patients; but today, because of the complications that may be associated with leaving the colon, whenever ileostomy is decided upon we plan to complete the total colectomy. In this last six-year period of the 189 patients who had total colectomy one-third had ileostomy and colectomy done at a single stage, whereas two-thirds had a three-stage procedure performed, with ileostomy, colectomy and abdominoperineal resection.

I would like to present to you another point in surgical treatment that has not been properly emphasized. This is about the possible late mortality associated with the surgical treatment of ulcerative colitis. It is important to realize that there are complications which may result fatally from the operative procedures themselves. This point is brought out by study of the 219 patients operated upon in the past six years. There were eleven postoperative deaths. Most of these patients had been followed from one to five years. Seven patients subsequently died at home from what we can assume, and is known in most instances, were complications of the operative treatment. This makes a total mortality of the group of 219 patients operated upon during this six-year period of 8.2 per cent. This late mortality is for the most part preventable and its reduction must be our goal.

The mortality following surgical treatment of ulcerative colitis will be reduced by a more conservative surgical management, by proper selection of time for operation on the part of both internist and surgeon, and by proper surgical procedures. A point of particular importance is that these patients must be followed regularly for the duration of their life. It must be impressed upon them that they must report any difficulties with the function of the ileostomy, or other abdominal symptoms. Finally, it must be accepted that it is the responsibility of both the internist and surgeon to maintain an interest in patients with ulcerative colitis who have been submitted to surgical care for the remainder of their life or the patient's life.

MANAGEMENT OF THE ILEOSTOMY*

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THIS article deals specifically with the care and management of the ileostomy. On occasion the ileac stoma has been an enigma but we are directing our efforts toward a better understanding of it. We want it to have a better reputation among physicians and surgeons, particularly gastroenterologists, so that they are less loath to recommend surgery in the intractable cases. I believe that the ileostomy and its problems are the main determents to surgery in ulcerative colitis; and when the way is paved for a rational basis of management, more of these desperately ill patients will come to operation rather than suffer over the years with expensive and ineffective treatment.

APPLIANCES

A most signal advance in the care of the ileac stoma was made in 1936 by Koenig and Rutzen when they created an appliance that would cement to the skin. Protection from the corrosive action of small intestinal content was finally achieved. Today, thanks to the efforts of former patients, we have appliances that are comfortable, relatively invisible and do not leak. They easily fulfill the patients' requirements for economic and social adjustment.

This discussion necessarily starts with a simple technic of ileostomy, since the surgeon's responsibility is to make the ileostomy in such a way that modern appliances can be used.

The ileostomy site should be so chosen that a standard pouch will not impinge on bony prominences. (Fig. 1.) We choose this area by placing a Torbot ring† in the right lower quadrant with the patient in a sitting position. If raising the right thigh and bending forward do not interfere with the ring, it is cemented on for a twenty-four-hour trial.

The skin around the ileostomy should be smooth and unbroken to accommodate the disc; therefore the surgical approach to the colon should be made from the midline or left side of the abdomen. (Fig. 1.) The ileostomy is brought through a small stab wound in the predetermined area on the right side.

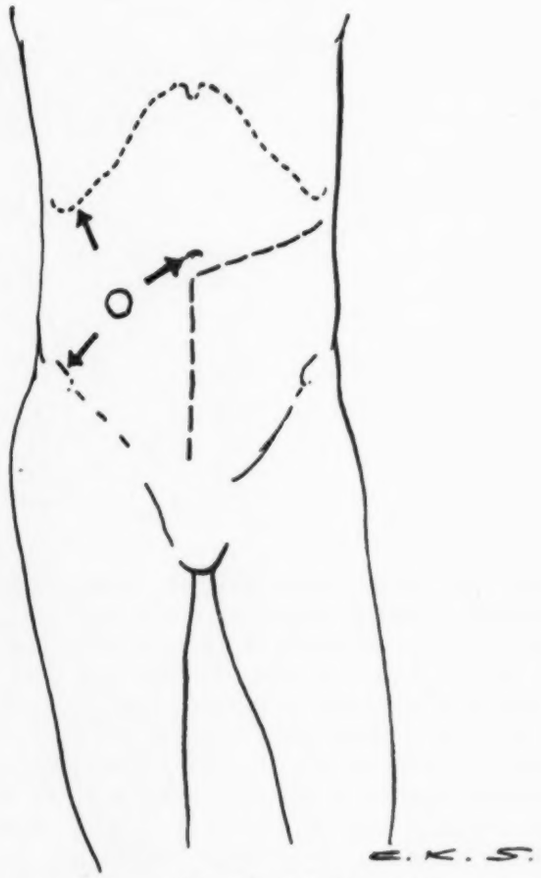


FIG. 1. Selection of ileostomy site.

The postoperative care of the ileostomy begins in the operating room. Figure 2 shows the details of the method by which the ileostomy is supported on the abdomen. A double fold of Vaseline gauze is wound loosely around the stoma three times and secured with clips in the gauze only. The inferior border of the collar is fixed to the subcuticular fascia and the open end of the stoma is attached to the outer border. No tube is placed in the ileostomy.

The skin around the base is cleansed with

† Manufactured by The Torbot Company, Providence, Rhode Island.

* This paper received the A. B. Graham Award for 1953.

ether and a special polyethylene bag* is applied.† (Figs. 3 and 4.) The wide end of the bag is retracted (Fig. 5) allowing a full view of the skin around the ileostomy. (Note that the standard wide aperture in the disc allows a centimeter or more of clearance at the base. examination and palpation of the ileostomy and its contents at any time without removal. Should catheter decompression of the stoma be necessary during the first ten days, it can be done easily by retracting the wide end of the bag as shown in Figure 5. If a new one is

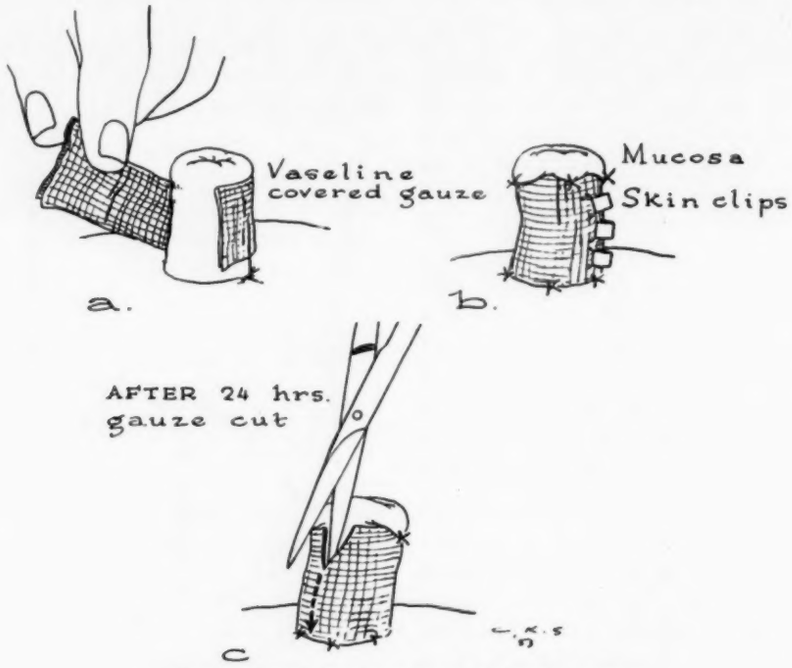


FIG. 2. Operating room care of the ileostomy.

Any rigid structure placed too closely will erode into the ileostomy, creating a skin level fistula.) This skin is moistened and Karaya gum powder‡ is applied, which forms a tenacious gelatinous mass over the exposed area to protect it from ileal content. It is necessary to apply a little Karaya to this area daily. Figure 4 shows the bag in position, the lower end being shut off by a rubber band. In some instances in which the ileostomy output is excessive, the bag can be connected with a tube and bottle on the floor. (Fig. 6.)

Twenty-four hours after surgery there is usually enough edema of the ileostomy to prevent retraction and the gauze collar is slit throughout its length on one side. (Fig. 2*c*.) It is removed completely on the second or third day. There are many advantages to the polyethylene bag. It is transparent and allows applied every second or third day, there is no leakage and therefore complete protection of the skin and minimal nursing care.

On the tenth day (Fig. 7) the Torbot appliance is substituted for the polyethylene pouch. By this time some of the edema of the ileostomy has subsided and the patient is ready to be discharged from the hospital. It must be remembered that it takes between three and five weeks for a 1¼ inch ileostomy to evert and shrink to its permanent size. During this period the aperture in the appliance must be adjusted every two weeks to fit the diminishing ileostomy diameter if the skin at the base is to be protected. The Torbot appliance is particularly suited to this period since the disc is readily removed from the bag and can be obtained with apertures of any size. Usually three discs with apertures 1¼ inch, 1 inch and ¾ inch are necessary at two-week intervals. When shrinkage is complete at the end of the sixth week, the diameter at the base of the ileostomy is calibrated and the permanent size disc is ordered. At the same time, one or two other types of

* Designed by W. E. Furr, Jr., M.D. and produced by The Marlin Company, Cleveland, Ohio.

† Any standard ileostomy bag cement.

‡ Manufactured by The John F. Greer Company, Oakland, California.

3 4 5

FIGS. 3 to 5. The postoperative polyethylene bag.

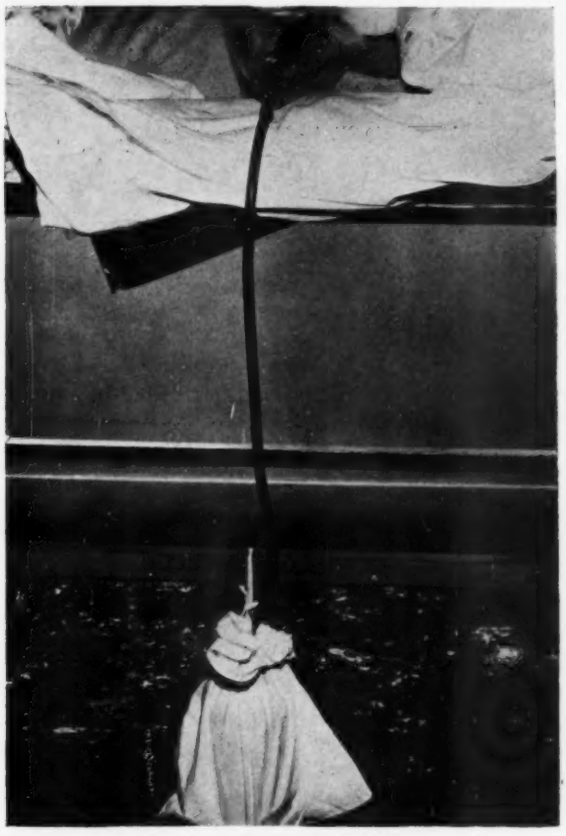


FIG. 6. Continuous bag drainage.

"cement on" pouches are recommended because of particular features. The Rutzen* and Permatype* pouches are particularly satisfactory. The Permatype pouch is made to order to fit unusual abdominal contours (Fig. 8) and may be worn several days to a week, while the Rutzen pouch will be satisfactory in most instances. We advise patients to wear different types of bags alternately much as one would wear different pairs of shoes.

* Manufactured by H. R. Rutzen Company, Chicago, Illinois.

† Manufactured by Eastern Sales Company, West Hartford, Connecticut.

CARE OF THE SKIN

Most patients who undergo surgery for ulcerative colitis are in poor condition. The skin is soft and may react violently to an irritant or slight trauma. Some of the cements used with appliances have an irritating hydrocarbon solvent which may cause vesiculation of the skin if not allowed to evaporate completely before the pouch is applied. Also, the too rapid or

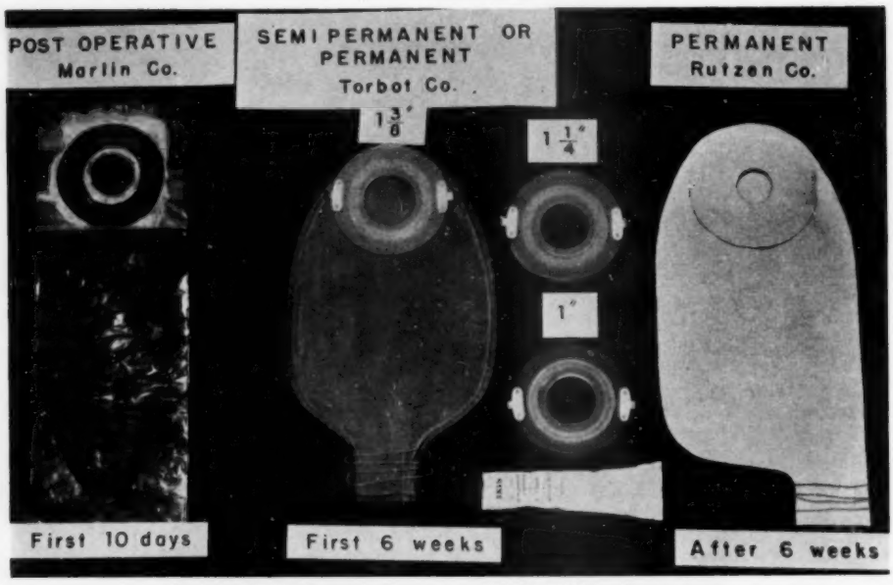


FIG. 7. Ileostomy appliances; selection following surgery.

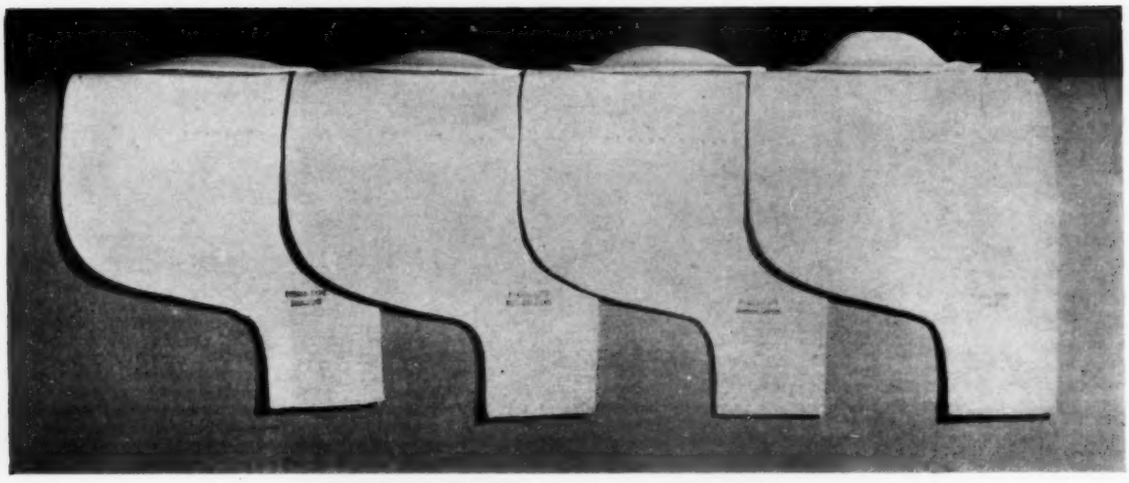


FIG. 8. The Perma-type ileostomy bag.

frequent removal of the adherent disc will result in pulling off the outer layers of epithelium and a red weeping surface may appear. In such instances the skin should be cleansed with ether and dusted lightly with powdered Karaya. The Karaya and exhudate form a thin gum which is completely adherent to the moist areas. The adhesive cement can then be applied over all and an appliance cemented on. In advanced cases it is best to revert to the post-operative polyethylene bag for a few days until the superficial epithelium has regenerated. We have not seen skin corrosion or reactions around the ileostomy that will not respond to this treatment and as far as we know, no other substance but powdered Karaya will adhere to such a weeping surface—thus presenting a dry surface for the application of "cement on" appliances.

The best protection for the skin is a close fitting appliance that will carry the ileal discharge away without contamination; the pouches mentioned herein fulfill these requirements provided thay are fitted as indicated.

ILEOSTOMY DYSFUNCTION

The newly made ileostomy does not function properly in the majority of instances. Close observation will reveal the patient's symptoms to be those of partial obstruction of the small bowel due to inflammatory edema and rigidity of the ileostomy itself. Actually, there is no

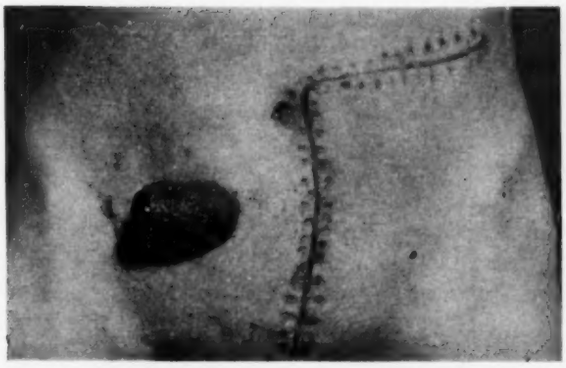


FIG. 9. Peritonitis of the tenth-day ileostomy; thickened granular serosa.

organic obstruction to ileal flow. A finger or tube may be passed with ease but symptoms of obstruction are still present. We believe that such functional obstruction is the chief cause of the fluid and electrolyte problem in the ileostomy patient rather than the establishment of a small bowel fistula *per se*, and it can be prevented. One of the reasons that the ileostomy patient's life occasionally hangs by a string is that a chronically ill patient with a small body mass is subjected to partial intestinal obstruction with its devastating effects.

The reasons for functional ileostomy obstruction are obvious. This naked segment of small intestine is suddenly subjected to trauma and infection. By the third day it is covered with fibrinopurulent exudate and there is some edema. On succeeding days, induration and serosal peritonitis are progressive and maximum rigidity is noted about the tenth day. (Fig. 9.) While peristalsis can be observed for a few days in the new ileostomy, it soon disappears.

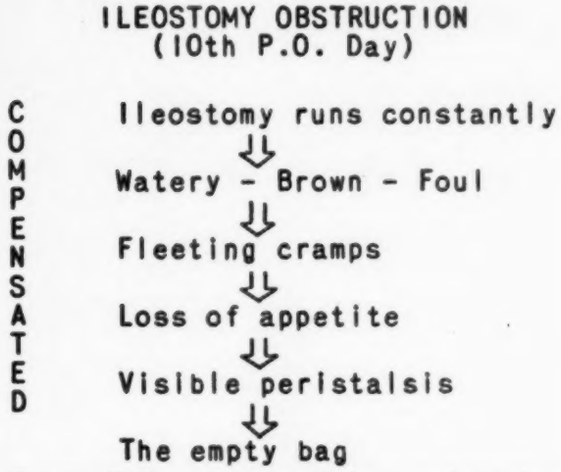


FIG. 10. Early symptoms and signs of obstruction.

With increased rigidity and decreased to absent peristalsis, functional obstruction is present. All the sequelae of obstruction supervene and influence the clinical course of the patient. (Figs. 10 and 11.) There is increased peristalsis above the ileostomy, with subsequent cramps. The normal thick yellow-green ileostomy content becomes thin, watery and

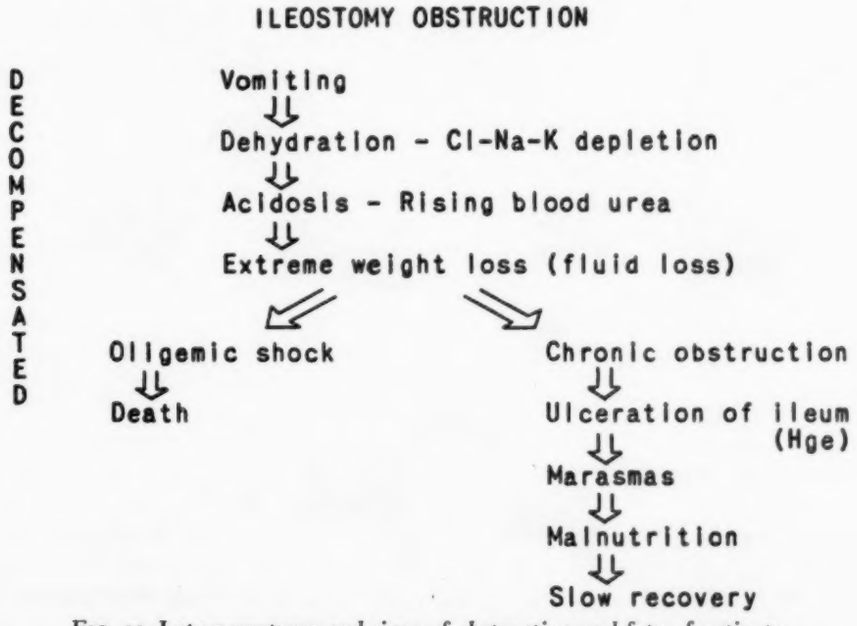


FIG. 11. Late symptoms and signs of obstruction and fate of patients.

brown; the stoma discharges continually. A colon type of odor becomes apparent and cultures of the stool show a shift from the normal ileal flora to that of the colon in number and type. Gradually inflammatory changes in the ileostomy and obstructive symptoms subside simultaneously with resolution of symptoms.

FIG. 12. Maturation of ileostomy; sequence of events.

Each newly made ileostomy must evert its mucosa enough to meet the abdominal skin at the base. The exposed serosal surface is then protected and as eversion takes place, edema and peritonitis subside. We have given the term "maturation" to this process. (Fig. 12.) It follows that a long ileostomy will mature slowly and a short one rapidly; hence less obstruction with a short ileostomy in the postoperative period. To hasten "maturation" we have trimmed the stoma on the seventh day in such a way as to leave the mucosa long enough to evert part of the way down the sides of the ileostomy. (Fig. 13.) In a personal communication Crile suggested complete maturation on the seventh day by bringing the mucosa down to the abdominal skin and fixing it with sutures. Together we have carried out this procedure in five instances with promising results. More recently, Crile has suggested complete mucosal eversion (graft) at the time of colectomy. This would provide a physiologic dressing to the naked segment of ileum, preventing its peritonitis and therefore its dysfunction.

TREATMENT OF DYSFUNCTION

All newly made ileostomies present some symptoms of dysfunction although they may be so mild as to go unnoticed. Large amounts of

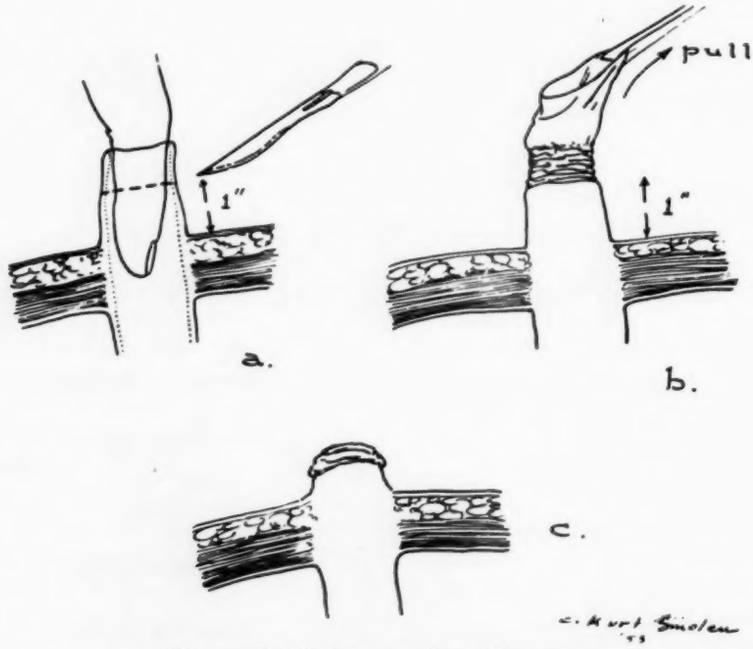
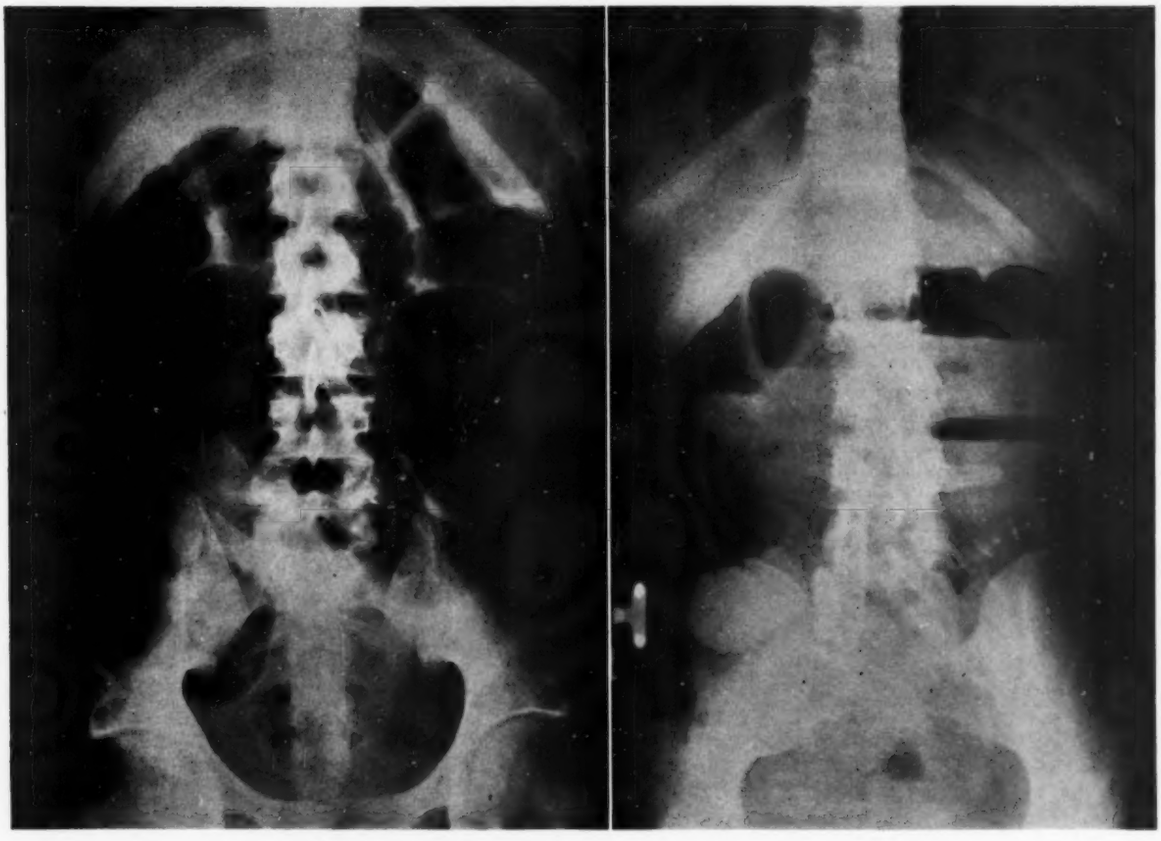


FIG. 13. Surgical maturation of ileostomy.



14 15

FIGS. 14 and 15. Ileostomy obstruction; flat and upright films of the abdomen.

gas, mild cramps and a copious, thin, water, ileal discharge are fairly well tolerated in most instances. However, when the patient exhibits preliminary massive weight loss, as in long-standing chronic forms of the disease, no intestinal obstruction whatever is tolerated. The contracted extravascular space is readily exhausted. The orbits become dry, the eyes sunken and the cheek bones prominent. Massive amounts of intravenous fluids are necessary and gastric suction may be required to prevent regurgitation. Flat and upright roentgen films (Figs. 14 and 15) of the abdomen will reveal intestinal obstruction and laparotomy has been done in the past looking for "obstruction."

When the clinical course following total colectomy is unsatisfactory, attention must be diverted to the ileostomy. In the absence of peritonitis (rare), ileostomy dysfunction is the commonest cause of patient deterioration, fluid and electrolyte imbalance, and failure to gain weight. Since obstruction is present, treatment is simple decompression with a retention tube in the ileostomy. Utilizing a polyethylene bag

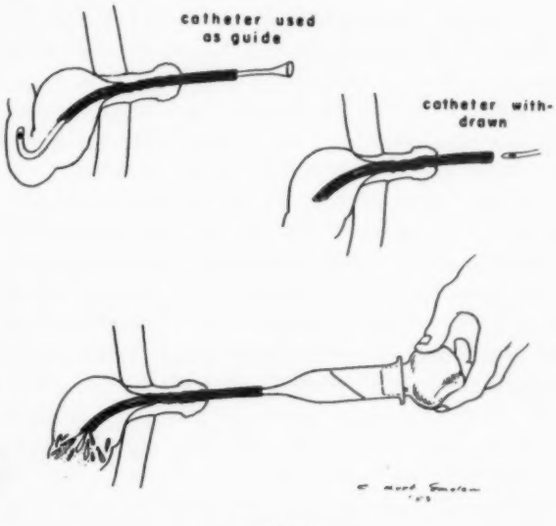


FIG. 16. Ileostomy dysfunction tube.

in the immediate postoperative period makes the early signs and symptoms of dysfunction easily recognized. (Fig. 10.) Treatment is instituted with the onset of intestinal cramps.

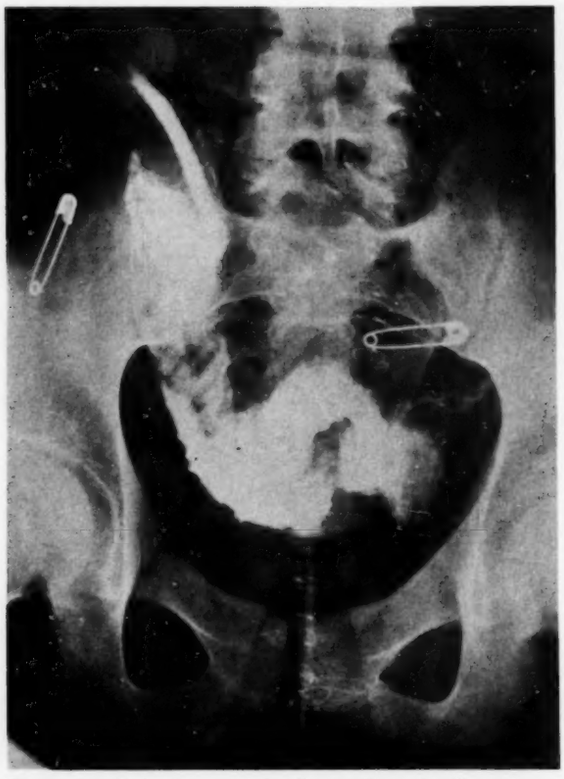


FIG. 17. Injection of barium through ileostomy. Note dilated ileum and ulcerative ileitis due to chronic ileostomy obstruction. Recovery with retention tube in ileostomy.

The latex tube with its catheter obturator (Fig. 16) is easily inserted, the obturator withdrawn and the tube held in place by a single silk suture through the end of the ileostomy. When food residue causes obstruction, lavage through the tube with saline will relieve it.

Maturation of the ileostomy may occasionally be retarded in the chronically ill, wasted patient, greatly prolonging the period of partial obstruction. Convalescence is drawn out, there is failure to gain weight, and dilatation and ulceration of the terminal ileum may occur. (Fig. 17.) In such instances the thickened infected serosal coat (called "the Bishop's collar" by the late Dr. T. E. Jones) of the ileostomy contracts, causing further obstruction. Here a more permanent type of retention tube* is most useful and may be worn in the ileostomy until

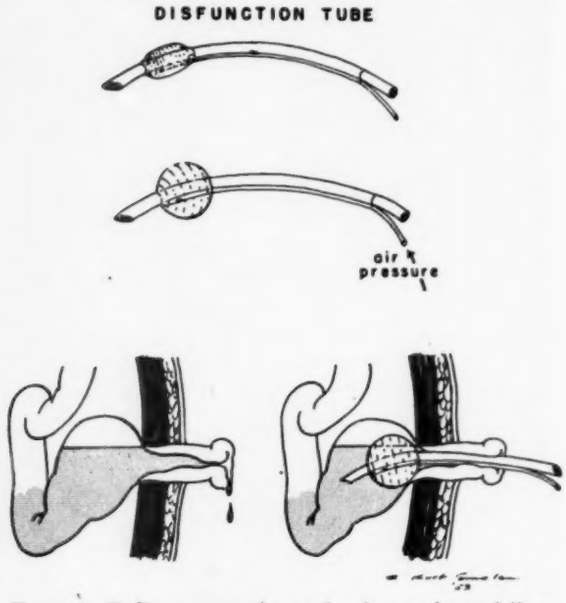


FIG. 18. Balloon retention tube for prolonged ileostomy drainage.

maturation is complete. (Fig. 18.) With continuous decompression remarkable changes take place in the patient's economy. The watery brown foul stool is replaced by normal thick yellow-green contents. Appetite returns and weight gain is noted. The dilated terminal ileum contracts and the ulcerative ileitis heals. This retention tube is easily placed or withdrawn by the patient when necessary. There have been no perforations so far and the tube has caused no damage. The balloon should be inflated only with enough water to keep it in.

* C. R. Bard Company, Summit, New Jersey.

DISCUSSION OF SYMPOSIUM ON CHRONIC NON-SPECIFIC ULCERATIVE COLITIS

LELAND S. McKITTRICK, M.D. (*By Invitation*)
Boston, Massachusetts

THERE were two things that prompted me to accept the invitation to discuss the papers of this symposium. First, I did not think there was any condition about which we know so little and can talk so much. So I was sure that left me with a little leeway somewhere. Second, since I was given the privilege to be what you might call the cleaner-upper, this also gave me certain liberties. However, I find that there isn't much to clean up because the whole subject has been so well covered. The best I can do is to pick out a few high spots here and there and just say a word or two about each.

The first thing I wish to touch upon is the question of diagnosis. I am intrigued by what I think we may call, and probably do call, localized proctitis that I see from time to time in my office. This condition seems to stay localized for a long period of time. I get the feeling that maybe this is a disease different from the other disease. However, we then see a man in the late fifties or early sixties who has had this condition for a great many years which suddenly develops into an acute, typical, rather fulminating type of ulcerative colitis for which surgery is indicated.

The next thing in the question of diagnosis is the great range of symptomatology of this disease. That isn't quite the right word. I am thinking more in terms of its clinical course; and I am thinking now particularly of some of these very acute fulminating cases, which seem to come on in a way that leaves the average clinician totally unsuspicious as to the nature of the condition. Here, I wish to stress again the point that Dr. Jones has made. It is a point which is too frequently overlooked by both surgeons and physicians. I refer to the ease with which a sigmoidoscope can be inserted into the rectum of anybody, no matter how sick he or she is, provided the anal orifice is not too sore and tender and plenty of grease is used. If one can get a good look at the mucous membrane, the problem of diagnosis may be solved so easily from that little examination. We have seen these patients operated upon and have seen them die with the true diagnosis unsuspected.

The next thing I want to re-emphasize is the value of team work. As Dr. Jones has pointed out, the patient with ulcerative colitis is a different type of patient from any other that I, at least, as a surgeon, have to deal with. That is the reason so much is said about psychiatric treatment. I do not know whether I am emphasizing what has been said or not, but I should like to make this clear: I believe that ulcerative colitis, while it frequently occurs in a patient who is probably a little on the not wholly normal side, is still a desperately serious organic condition, and that any time someone transfers the responsibility of a patient seriously ill with ulcerative colitis to a psychiatrist, he may be signing the death warrant of that patient.

The patient with ulcerative colitis is a desperately sick, medical patient and should remain under the control and responsibility of the internist. If the latter wants to bring the psychiatrist in for a little aid now and then, that is okay. The kind of psychiatry these people need most is understanding by a good internist who can handle his patient's problems, emotional and physical. Then, if he has a specific psychiatric problem, the internist should bring in a psychiatrist and use him to the utmost. However, the psychiatrist should be a part of the team but certainly not the most important part.

Another thing I think Dr. Cattell brought up is one of the things that I have been deeply grateful to Dr. Jones for, namely, that it is not right for the internist to call the surgeon in to make a decision on a critically ill patient who has been under the internist's care for a matter of days or weeks. It is only right and proper that these very sick patients be seen early by all members of the team. This makes for better understanding and more accurate decisions for or against surgery and the time at which surgery should be done. This is just an expression of the teamwork that has been referred to.

I want to say just a few words about surgical treatment. As surgeons, we must recognize that when we operate on a patient with ulcerative colitis, we must have a very definite objective in view and that we also assume certain obligations. Our objective is to return that patient to what is a normal state of health. Surgery can cure ulcerative colitis. Therefore, if an ileostomy is decided upon, the surgeon must do whatever else is necessary in order to return the patient to a normal state of health.

It has never been wholly clear in my mind as to just how to interpret "obligations." I have, therefore, put them in terms of the result, which is a well, normal patient. I am still not totally convinced that an ileostomy means progression to total colectomy. My stand is not an easy one to justify because of the high incidence of cancer. Responsibility for the retained colon or rectum puts an added burden upon the internist or the surgeon who is following these patients, but there is a large number of younger individuals particularly upon whom ileostomies are done. Ileostomy is not a nice condition; it is better than the disease but it is not good. Even Dr. Turnbull admits he cannot make it good.

Now, I have faith enough to believe firmly that somebody is going to get the answer to ulcerative colitis, and those for whom it is possible to re-establish continuity will be especially grateful. Sexual impotency is quite an additional price for the young man to pay just to be sure he may not get cancer of the rectum fifteen years from now. I am still not convinced and in my own practice I do not follow the dictate that having done an ileostomy, I must go on to total colectomy. Any colon and any rectum which shows activity should be eliminated immediately; but I still have some young men and women around with pretty normal looking colons, and I suspect I am going to leave a few of them alone, probably for a while at least.

There is another point that I would like to mention, namely, the present trend toward massive surgery in one stage. We in surgery are now confronted, I think, with what may be a serious decision. We have reached the point where one can accomplish extraordinary technical undertakings with survival in many instances, in fact, most instances. So we are torn between doing what is technically possible, sometimes at the expense of what may be practically feasible. I am not at all sure that this enthusiastic trend to start in a patient's abdomen, go right around, pull out the ileum, and then down and take out the rectum, if too commonly adopted, is not going to cost lives. We are dealing with ulcerative colitis which is a non-malignant condition. Having successfully accomplished that which we hope to accomplish, namely, removal of the diseased bowel, we should have a permanently well patient. We cannot afford to increase the mortality of that procedure 1 or 2 per cent for the sake of a little time or for the sake of extra anesthesia.

I share the caution of Dr. Cattell. It may be that I have just reached a stage of maturity where I am old-fashioned. I am sure we can do more at one time than we used to do. An ileostomy followed in one to three months by total colectomy is a reasonable, feasible procedure in most patients in good condition. But I am apprehensive of the total or subtotal colectomies and the ileostomy in one stage on most patients who need an ileostomy.

In closing, I just want to tell you what I am sure everybody knows. I have been tremendously stimulated by Dr. Turnbull's discussion of the ileostomy. How my heart has ached over every problem that he has brought up, and probably a few more. How right he is about everything he says. It is hard for me, being naturally critical, to find nothing in what somebody says that I can criticize. I sat through that discussion practically spellbound and can find nothing with which to disagree. It is a superb presentation of facts worked out by someone who has had the imagination and has been willing to put the time and effort into doing a superb job. I would emphasize only two things: One, what it has meant to the patient and what it has meant to the nursing personnel never to permit the ileal contents to touch the abdominal wall in the postoperative period.

The next thing I wish to emphasize is the importance of the obstruction occurring at the distal ileum in these patients with ileostomies, and to stress again that in the early postoperative period the obstruction practically always comes distal to the skin at the advancing margin of the mucous membrane. The fascia and peritoneum will forever stay the same size you make it unless a stitch breaks. It will never get smaller. So these obstructions are never more than skin deep unless you created

in when you did the ileostomy. I am not sure I know what the size of the opening ought to be, but I make it so my index finger just fits in smoothly beside the ileum, neither tight nor loose.

Another point I intended to make earlier is what Dr. Cattell has brought out. It is not all sunshine and roses in the late periods after surgery for ulcerative colitis. One of the things that tempts me sometimes to leave a good looking colon in is the incidence of late small bowel obstruction, which I am sure has occurred in every clinic where colectomies have been performed. With the experienced men doing the operations, late obstructions are much less common; but in colectomies in general as they are done, the incidence of small bowel obstruction is high.

Papers Read by Title

A STUDY OF THE EFFECT OF TERRAMYCIN ON THE INTESTINAL FLORA

WITH SPECIAL REFERENCE TO THE ACCOMPANYING SIDE EFFECTS

RALPH F. ALLEN, M.D.

Miami, Florida

DURING the past few years the use of broad-spectrum antibiotics has become increasingly more common. Various gastrointestinal and anorectal complaints have been reported as "untoward reactions" during administration of these drugs. It was the purpose of this study* to determine what changes occur in the intestinal flora during administration of oral terramycin and to note what per cent of patients developed untoward symptoms attributable to the drug.

MATERIALS AND METHODS

Forty-eight subjects were studied. None of these patients had had gastrointestinal or anorectal symptoms before administration of the drug was begun. None had received any antibiotics within sixty days previous to this investigation. Oral crystalline terramycin hydrochloride capsules were used throughout the study. Dosage consisted of from one to four 250 mg. capsules administered with water every six hours.

Stool samples were examined before treatment was begun, at the end of seven days' therapy and after completion of fourteen days' therapy. The bacteriologic survey consisted of the determination of "total" numbers of bacteria per gram by weight of sample and of individual counts for aerobes, anaerobes, escherichia species, lactobacilli and yeasts.

Within six hours after passage 500 mg. of macerated feces was weighed out on wax paper and diluted with 49.5 ml. of sterile distilled water. The presence of glass beads in this initial diluent afforded good dispersion during shaking.

* This investigation was supported by grants from Chas. Pfizer & Co., Brooklyn, N. Y.

Further dilutions of 10^4, 10^6, and 10^7 were then prepared. Pour plates employing all dilutions were used to determine the bacterial numbers for the various organisms.

All plates were incubated at 37°C, for forty-eight hours, and colonies enumerated under a Quebec colony counter. Plate counts were generally the average of two plates representing different dilutions.

Anaerobic conditions were obtained by use of the Brewer jar illuminating gas modification.

Identification of representative colonies was based on selectivity of medium, colonial characteristics and cellular morphology as determined by Gram's stain.

The media used included Johansson-Sarles-Shapiro medium for anaerobes,[1] and Eosin Methylene Blue medium (Difco) to detect the coliform group. Medium for detection of lactobacilli was prepared according to the formula recommended by Rogosa, Mitchell and Wiseman.[2] The selective medium for S. fecalis was prepared according to the formula ("SF") as outlined by Hajna and Perry,[3] and Sabouraud dextrose agar (Difco) was used for yeast.

The pH of all samples was determined by use of the Beckman pH meter model N.

Pretherapy stool studies were made on all subjects. At the end of seven days' therapy forty were examined and thirty-five were studied again after completing fourteen days' therapy.

RESULTS

Laboratory Data on Thirty-five Subjects Who Completed Fourteen Days of Medication. The effect of oral terramycin on the "total" aerobes, anaerobes, S. fecalis, escherichia

species, and yeasts in the intestinal tract is summarized in Table I.

After one week of therapy the percentage of subjects with an increase in bacterial numbers was as follows: aerobes, 86 per cent; anaerobes, 89 per cent and S. fecalis, 54 per cent. The remaining subjects showed a decrease or no appreciable change. Following two weeks of medication, the aforementioned bacterial numbers were frequently the same or less than those at the end of the first week.

TABLE I

QUANTITATIVE CHANGES IN FECAL BACTERIA OF THIRTY-FIVE SUBJECTS DURING ADMINISTRATION OF ORAL TERRAMYCIN

Change in Count	Aerobes				Anaerobes				S. Fecalis			
	One Wk.		Two Wk.		One Wk.		Two Wk.		One Wk.		Two Wk.	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Increase	30	86	28	80	31	89	25	71	19	54	26	74
Decrease	5	14	7	20	4	11	10	29	10	29	7	20
Eliminated	0	0	0	0	0	0	0	0	6	17	2	6

	Coliform				Lactobacilli				Yeasts			
Increase	18	51	21	60	9	26	26	74	33	94	11	31
Decrease	3	9	6	17	5	14	4	12	2	6	21	60
Eliminated	14	40	8	23	21	60	5	14	0	0	3	9

On the seventh day of medication 74 per cent of the patients had decreased lactobacilli counts and 94 per cent had increased yeast numbers. At the end of fourteen days this pattern was reversed. At this time 69 per cent showed a decrease in yeast and 74 per cent had an increase in lactobacilli colonies.

TABLE II

PERCENTAGE OF THIRTY-FIVE SUBJECTS WITH TERRAMYCIN-RESISTANT MICROCOCCUS, AEROBACTER, ESCHERICHIA AND PROTEUS SPECIES

Length of Therapy	Micro-coccus	Aero-bacter	Escher-ichia	Proteus*
One wk	6%	54%	11%	49%
Two wk	9%	74%	40%	63%

* Observed on pretherapy plates of two subjects (6 per cent).

The coliform organisms were effectually depressed or eliminated in 49 per cent of the cases at the end of one week. At the conclusion of two weeks therapy resistant strains became apparent.

The percentage of subjects manifesting resistant strains of micrococcus, aerobacter, escherichia and proteus species at the end of one and two weeks of medication with oral terramycin is shown in Table II. Pseudomonas colonies were observed on plates from one subject (W. W. B.).

Hydrogen-ion concentration of stool samples: The observed ranges of values were as follows: pretherapy pH 5.9–7.9; at one week pH 5.5–8.0; and at two weeks, pH 6.0–8.5.

Gastrointestinal and Other Side Reactions Encountered. The side reactions observed during the study of forty eight subjects are

TABLE III

SUMMARY OF UNTOWARD EFFECTS OF ORAL TERRAMYCIN ON FORTY-EIGHT SUBJECTS

	Total	Per cent	Males	Per cent	Females	Per cent
No. Studied	48	100	24	50	24	50
One or more symptoms	31	65	14	58	17	71
Nausea and vomiting	16	33	5	21	11	46
	5	10	2	8	3	13
Diarrhea	10	21	5	21	5	21
Prurutis ani	18	38	7	30	11	46
Abdominal cramps	9	19	3	13	6	26
Sore tongue	3	6	2	8	1	4
Generalized rash	1	2	..	..	1	4
Ulcerations of rectum	1	2	..	..	1	4

summarized in Table III. The incidence and severity of reactions increased as higher dosages were prescribed. Only two of ten subjects receiving more than 2 gm. of antibiotic daily were free of complaints.

Nausea and vomiting were the most frequent side reactions encountered, occurring in 33 per cent of all cases. These complaints subsided rapidly when the drug was stopped or the dosage decreased. The next most common symptoms was pruritus ani. This symptom often began after terramycin had been taken for one week or more, and in two subjects pruritus began one week after a fourteen-day course of therapy had been completed.

Diarrhea occurred in 21 per cent of our patients, usually beginning during the first seven days of therapy and occasionally continuing for from one to two weeks after terramycin was discontinued. Most of the cases of diarrhea, however, subsided rapidly when the drug was stopped. Once the diarrhea subsided there was no recurrence. In no case was permanent damage noted.

Unusual Reactions to Terramycin. DeL., a sixty-two year old woman, received 18 gm. of the antibiotic during a period of eleven days as treatment for bursitis. Pruritus ani was evident on the ninth day of therapy. On the eleventh day a generalized macular rash developed on the face, abdomen, back and arms, with edema of the face and eyelids. Within forty-eight hours after discontinuing the drug the rash and edema subsided. No previous history of drug allergy was noted.

A. B., a sixty year old healthy woman, received 26.25 gm. of the antibiotic during a period of two weeks. Vomiting occurred on the first day of medication. Pruritus ani commenced on the fifth day and diarrhea (ten to twelve stools daily) was present on the tenth to twelfth days. A proctoscopic examination at the end of therapy revealed multiple discrete rounded ulcers scattered throughout the rectum and lower sigmoid. The base of the ulcers was gray and the edges were sharply defined and elevated. The intestinal mucosa was edematous, but intact. After discontinuing therapy rapid healing of the ulcers ensued. Colonies resembling Monilia albicans were isolated from the stool sample.

COMMENTS

This study has shown that the "total" number of bacteria in the intestinal contents actually increases during administration of oral terramycin. Such changes are due to greater streptoccal, yeast and proteus numbers.

Similar alterations have been reported recently.[4] These results are not in accord with the theory of intestinal antisepsis due to oral administration of antibiotics.[5–9]

During the first week of medication a notable decrease in lactobacilli and escherichia species resulted. Frequently these organisms were completely eliminated. Concomitantly an increase in proteus and yeasts was recorded. During the second week of therapy escherichia, proteus and lactobacilli again appeared in the stool in appreciable numbers, and the yeast counts diminished. Yeast proliferation, then, appears to be influenced by the suppression of vitamin B synthesizers.

Multivitamin therapy[10,11] and ingestion of caseinized milk have been used as prophylaxis and treatment of untoward reactions due to broad-spectrum antibiotics. The failure of this type of therapy and the unsatisfactory response to vitamin B therapy[12] suggest that other factors also play a part in producing these symptoms. Ingestion of milk or cream impregnated with lactobacilli has often diminished the severity of mycin-induced gastrointestinal and anorectal complaints.[13]

The fecal pH was not appreciably altered by oral terramycin. The persistence of increase of yeast in the stool did not appear to be influenced by fecal pH. Lack of such correlation has been observed by others in vaginal[14] and intestinal[15] studies.

The incidence of untoward reactions following oral administration of terramycin has varied among reports. A 65 per cent incidence was noted in this study. Others[12,16,17] recorded from 25 to 56 per cent incidence. Such differences may be the result of different dosage schedules or unequal distribution of male and female subjects.

Ulcerations of the mucosa of the rectum and lower sigmoid developed in two patients (one male and one female). Stool cultures showed an abundance of yeast colonies. Species identification of the yeast strains is now in progress.

A diffuse generalized maccular skin rash and edema of the lower extremities developed in one patient having no history of previous antibiotic therapy. A case similar to the foregoing has been reported following the administration of aureomycin orally.[18]

SUMMARY AND CONCLUSIONS

1. Oral administration of terramycin does not produce antisepsis of the colon. Increased "total" bacterial numbers due to streptococci, yeast and proteus species occurred in many subjects studied.

2. Decreased lactobacilli and increased yeast counts were frequently noted after one week of therapy. The opposite pattern was observed at the end of two weeks of therapy.

3. Resistant strains of coliform and lactobacilli appeared during the second week of therapy.

4. In 65 per cent of the subjects some type of systemic side effect developed during this study. Thirty-three per cent experienced nausea; 38 per cent developed pruritus; 21 per cent complained of diarrhea and 19 per cent suffered abdominal cramps.

5. In two subjects visible evidence of actual pathologic disorder of the rectum and lower sigmoid developed, namely, ulceration or evidence of inflammation. One case of generalized skin rash was encountered.

6. In most cases symptoms attributable to the drug subsided rapidly when medication was stopped, and in no case was permanent damage noted.

Acknowledgment: All bacteriologic studies were made by Mr. Eugene Conrad, bacteriologist for Chas. Pfizer & Co.

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PLASTIC TREATMENT OF HIDRADENITIS SUPPURATIVA OF THE BUTTOCK

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HIDRADENITIS suppurativa, also called acne conglobata, is a chronic inflammatory disease involving the skin and subcutaneous tissue. When the disease is located around the anus, it is also called perianal pyoderma. Concerning this entity Brunsting[1] states that it "is characterized by the formation of abscesses and sinuses in selected regions of the cutaneous surface in which the apocrine type of sweat glands is situated. The favorite sites of involvement are the axillary, mammary, inguinal, genital and perianal regions.

FIG. 1. Case 1. The end result after using the infected skin graft.

"The course is extremely chronic and frequent remissions and relapses occur. The essential histological features include primary involvement of the apocrine sweat glands and dissemination of the disease throughout the subcutaneous tissue by means of the lymph channels."

This disease is not very common and is frequently confused with multiple anal fistulas, pilonidal fistulas and other inflammatory conditions. It affects young adults especially, but it can be found in aged people.

Treatment is essentially surgical. In the early stages, with a simple incision and drainage of the abscesses, a cure is obtained. In the chronic stages radical surgery is indicated with a wide excision *en bloc* of all involved areas, and skin grafting. Presented herein is a new and economical plastic treatment of this disease, when it affects the buttocks and it is necessary to remove a great quantity of tissue.

CASE REPORT

In January, 1950, a thirty year old man, was admitted. His buttocks, perianal and genital regions were involved by infection with multiple fistulas. The case reminded me of the picture seen on page 164 of Dr. Bacon's book.[2]

After a careful examination of the patient a diagnosis of hidradenitis suppurativa was made but there was confusion as to the appropriate treatment for this extensive infection, and how to replace all the tissues excised. Dr. Alberto Borges, from the Department of Plastic Surgery, was called in consultation.

Considering that a thin Thiersch graft is often effective in clean, though not aseptic wounds, and that nothing would be lost if we failed in trying to graft the wasted skin, which is usually discarded after excision of the involved area anyway, we decided to apply this procedure. The results were very satisfactory.

The following technic was employed: First we excised, with the aid of the Padgett-Hood dermatome, a strip of skin of split thickness from the involved area; then the lesion was excised *en bloc* and finally we grafted the skin we had taken on the healthy fascia covering the muscles of the region. During the excision of the skin with the dermatome pus could be seen flowing freely from the multiple sinuses. It was not easy to remove the skin due to the induration present, but whatever could be

2A

2B

3A

3B

FIG. 2. Case II. A, infected skin graft with drainage of the sinuses. B, final result after the grafts have taken.
FIG. 3. Case III. A, before treatment; B, final result after treatment.

FIG. 4. Case III. One year later.

A few weeks later it was decided to carry out the same treatment on the other buttock and incisions were made in those portions of the skin which were not easy to remove with the dermatome, to drain the sinuses around the skin graft.

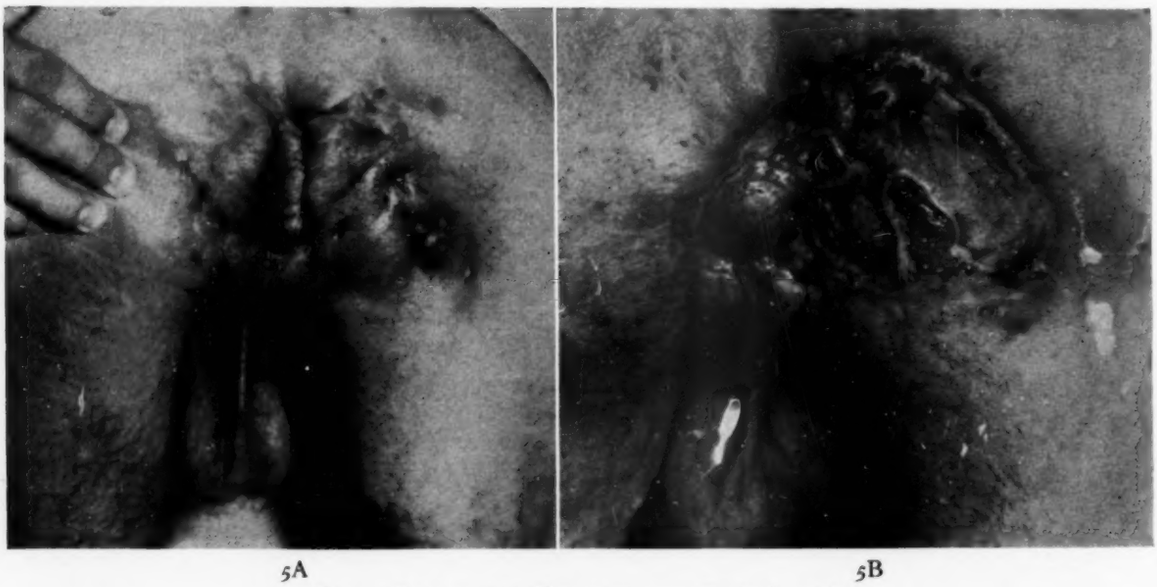
A month later we applied the same procedure in the perineum with an equally satisfactory result. (Fig. 1.)

COMMENTS

After this case we employed the same treatment on three other patients with hidradenitis of the buttock, with the same beneficial results. (Figs. 2 to 5.)

Of these cases one (Fig. 4) has been examined a year later and the patient is completely cured, with a sufficient amount of skin to permit freedom of movement without discomfort.

In one of the cases there was an extension of the infection to a portion of the external side of the buttock, the skin of which could not be removed was later used as a graft. Due to the extent of the process we first operated on the right buttock.



5A 5B

FIG. 5. Case IV. A, before treatment; B, final result.

We were surprised how this graft of the "wasted skin" prospered although it was surrounded by pus exuding from the other sinuses around the tissues excised.

Every two days the graft was inspected. It sometimes was covered by pus but continued in good condition, until finally, we were astonished by the good results.

removed with the dermatome. This skin was cyanotic and was entirely separated from the sinuses beneath it in an area of 2 square inches. We made an incision down the middle, from the limit of the infection in the buttock, removed with scissors the subcutaneous tissues of the skin flaps and scraped the sinuses. The incision was sutured perpendicularly to the vertical border of the skin graft. We expected to lose these flaps and were greatly astonished at the fine outcome.

In certain instances we either used the method of incisions or *en bloc* when it was not possible to remove the skin with the dermatome. In all of the cases preoperative treatment with penicillin was given to reduce the discharge, and we continued its use for a week postoperatively.

In one case there was also an anal fistula.

The foregoing treatment is applied in cases in which there is very extensive involvement of the buttocks by hidradenitis suppurativa and it is necessary to remove quite an amount of skin.

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CAUDAL ANESTHESIA FOR ANORECTAL SURGERY

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THE ideal anesthetic for anorectal surgery has yet to be evolved. However, the deposition of xylocaine hydrochloride into the caudal canal produces perineal anesthesia of profound degree, suitable to the needs of the proctologist, with the mimimum of undesirable side effects. Xylocaine has the following chemical and structural formula:

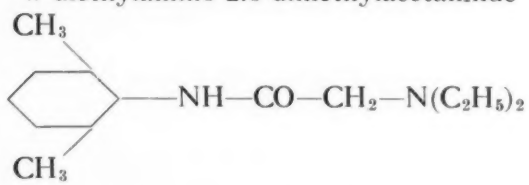
TABLE I
TIME FOR ONSET OF ANESTHESIA—2 PER CENT XYLOCAINE HYDROCHLORIDE

Total No. of Cases	Dose (cc.)	Average Time (min.)	Time (min.)	No. of Cases
22	10	5.7	1–5	11
			5–10	11
			10–15	0
5	15	6.6	1–5	3
			5–10	1
			10–15	1
16	20	7.6	1–5	7
			5–10	6
			10–15	3

TABLE II
TIME FOR ONSET OF ANESTHESIA—2 PER CENT XYLOCAINE HYDROCHLORIDE WITH 1:100,000 EPHINEPHRINE

Total No. of Cases	Dose (cc.)	Average Time (min.)	Time (min.)	No. of Cases
22	10	6.6	1–5	10
			5–10	10
			10–15	2
5	15	5.7	1–5	3
			5–10	2
			10–15	0
30	20	4.8	1–5	22
			5–10	7
			10–15	1

w-diethylamino-2.6-dimethylacetanilide



One hundred consecutive anorectal surgical patients operated upon with xylocaine caudal anesthesia were observed. Observations were made of the time interval between the administration of the drug and the onset of the complete anal and perianal anesthesia. The average time for various dosages was found to range from 4.8 minutes to 7.6 minutes. (Tables I and II.)

TABLE III
DURATION OF ANESTHESIA—2 PER CENT XYLOCAINE HYDROCHLORIDE

Total No. of Cases	Dose (cc.)	Average Time (hr.)	Time (hr.)	No. of Cases
22	10	2¼	1–1½	3
			1½–2	1
			2–2½	13
			2½–3	1
			3–3½	4
5	15	3¼	2–2½	1
			2½–3	0
			3–3½	4
16	20	2¾	1–1½	1
			1½–2	0
			2–2½	5
			2½–3	6
			3–3½	3
			3½–4	1

TABLE IV
DURATION OF ANESTHESIA—2 PER CENT XYLOCAINE HYDROCHLORIDE WITH 1:100,000 EPHINEPHRINE

Total No. of Cases	Dose (cc.)	Average Time (hr.)	Time (hr.)	No. of Cases
22	10	2¼	1–1½	5
			1½–2	0
			2–2½	9
			2½–3	2
			3–3½	2
			3½–4	4
5	15	3¼	1–1½	1
			1½–2	0
			2–2½	0
			2½–3	1
			3–3½	0
			3½–4	3
30	20	3	1–1½	1
			1½–2	3
			2–2½	4
			2½–3	1
			3–3½	6
			3½–4	9
			4–4½	6

Sensory anesthesia advanced from posterior

to anterior anal quadrants. Relaxation of the anal sphincter muscle adequate for surgery occurred before sensory anesthesia was complete. In the majority of cases the operation was started minutes before full sensory anesthesia had appeared anteriorly. This was done without discomfort to the patient by starting the surgical procedure posteriorly.

The duration of the anesthesia ranged from one hour to four and one-quarter hours. The average duration was two and a quarter hours. The use of larger amounts of the drug and the addition of 1:100,000 ephinephrine did not appear to affect the duration of the anesthesia. (Tables III and IV.)

The level of anesthesia varied with the size of the dose. The larger the amount of the agent, the higher the level of anesthesia effected. In all cases there was complete loss of sensation about the anus, with profound relaxation of the perineal muscles.

In the majority of the forty-four patients receiving the 10 cc. dose, the drug diffused readily throughout the caudal canal to involve the roots of all the sacral nerves. The highest level reached was that of the second lumbar nerve. (Figs. 1 and 2.)

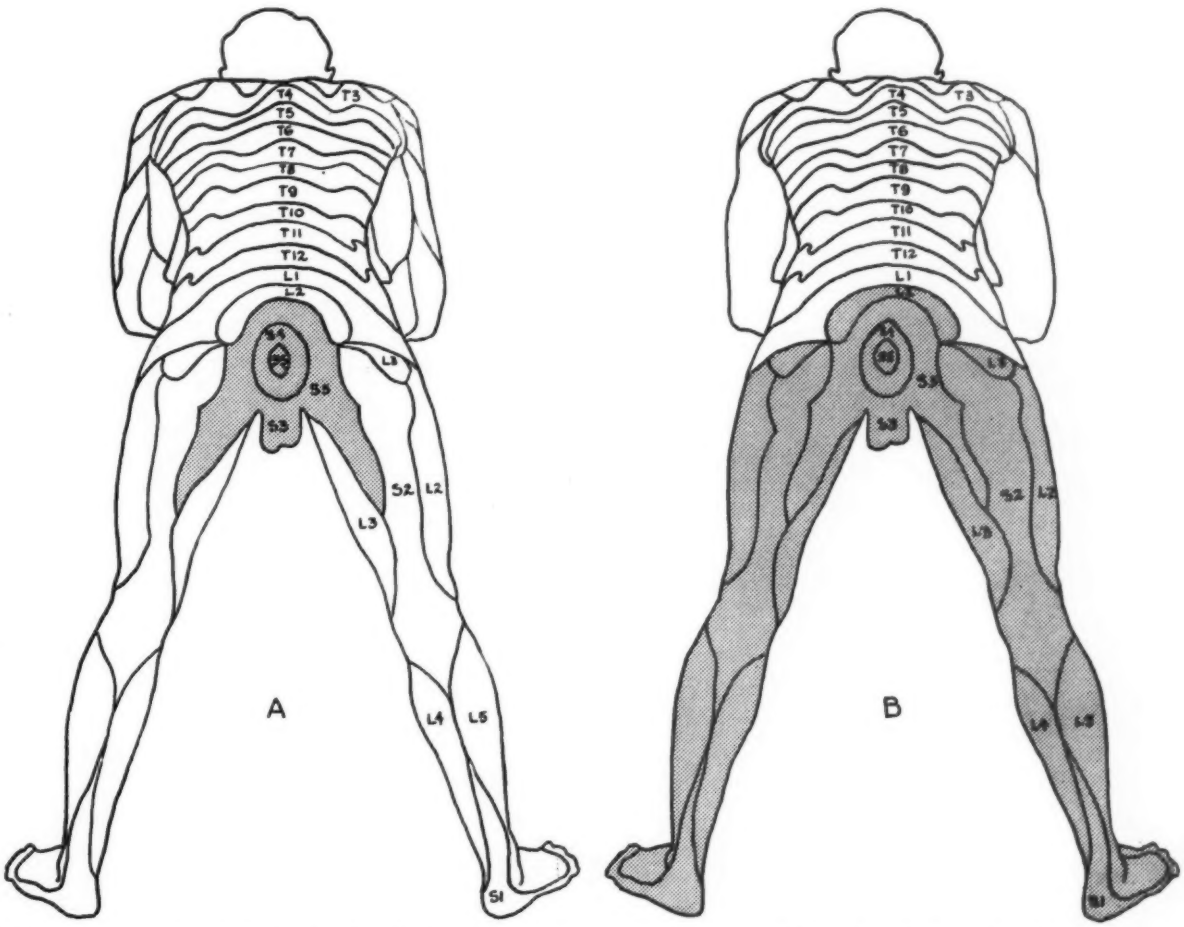


FIG. 1. A, lowest level of anesthesia using 10 cc. of 2 per cent xylocaine; B, highest level of anesthesia using 10 cc. of 2 per cent xylocaine.

In the forty-six patients receiving the 20 cc. dose, the level of anesthesia varied from involvement of the roots of distal sacral nerves to involvement of the sixth thoracic nerve. In the average patient this dose produced anesthesia of all the sacral nerves and hypalgesia of the distal lumbar nerves. (Figs. 3 and 4.)

VOLUNTARY SPHINCTER MUSCLE ACTIVITY

In all patients marked relaxation of the sphincter muscle occurred before sensory anesthesia was complete. The degree of sphincter paralysis varied. With the smaller dose (10 cc.) approximately 50 per cent of the patients

could voluntarily contract the sphincter muscle either weakly or strongly.

With the larger dose (20 cc.) approximately 25 per cent could voluntarily contract the sphincter muscle weakly or strongly. Those patients who could contract the sphincter muscle could not perceive that the muscle was functioning.

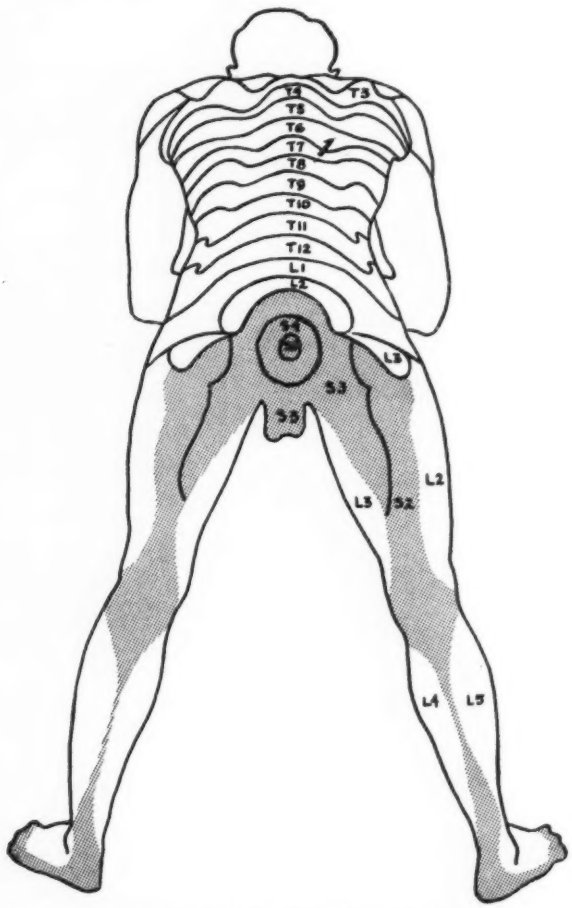


FIG. 2. Average level of anesthesia using 10 cc. of 2 per cent xylocaine.

PARALYSIS OF THE LOWER EXTREMITIES

The degree of motor paralysis of the lower extremities varied with the size of the dose. With the smaller dose (10 cc.) the majority had full use of the lower limbs at termination of surgery. Approximately 20 per cent had some degree of motor paralysis, being able to move the lower limbs weakly or sluggishly. These required assistance in moving from the operating table to the surgical cart at the termination of the operation.

With the larger dose (20 cc.) over 50 per cent had full or partial motor paralysis of the lower limbs. With this larger dose the lumbar nerves are more likely to be reached, with resultant greater loss of motor function of the lower limbs.

REACTIONS

Urinary. It was necessary to catheterize forty-two of the one hundred patients during the first twenty-four postoperative hours. Two patients required catheterization during the second twenty-four hour postoperative period and in both of these an indwelling Foley catheter was inserted. There was no significant decrease in the incidence of catheterization with the use of the smaller dose (10 cc.) of the agent.

Cephalalgia. No patient complained of headache postoperatively attributable to the anesthesia.

Nausea and Vomiting. Nausea occurred as a minor reaction in two patients. No therapy was needed. Vomiting alone occurred in six patients. Five of these cleared without therapy. To the sixth patient intravenous sodium pentothal was administered. Vomiting with concomitant hypotension occurred in three patients. With correction of the hypotension, the vomiting ceased.

Hypotension. This complication occurred in 8 per cent of the patients. All responded promptly to simple therapy. Small doses of vasopressor drugs during surgery or the return to the supine position after surgery was the therapy used.

Factors Responsible for Hypotension. The prone-jacknife position was used in all patients. It was believed that this was the important factor in the development of the hypotension reactions. The hypotension reactions occurred in the fifty to seventy year old age group. Cardiac, pulmonary and vascular disease increase the incidence. Heavy sedation adds to the circulatory and respiratory depression. Vasodilatation due to paralysis of sympathetic vasomotor fibers, where the anesthetic agent reaches the thoracolumbar levels, results in vascular pooling and circulatory depression.

Toxicity. In the author's opinion no reactions observed could be attributed to drug toxicity. Xylocaine possesses toxic qualities estimated by some observers as being greater than those of procaine; however, in caudal anesthesia, toxicity should be less as one-third to one-half the procaine dose is used. Adriani

states that the intravenous toxicity of xylocaine in animals is less than that of procaine.

CONTRAINDICATIONS TO CAUDAL ANESTHESIA

Emotional Factors. The patient who is apprehensive prior to the operation can be prepared by the usual sedative premedication. If the patient has not been well premedicated, the further intravenous administration of sedatives can be used to induce sleep following the administration of the caudal anesthesia. Such sedation will reduce the incidence of patients not emotionally suited to caudal anesthesia.

Infection. Caudal anesthesia is contraindicated when the following exist: (1) pilonidal cyst-sinus; (2) soft tissue infection of the sacrococcygeal area and (3) periostitis and osteomyelitis of the sacrum or coccyx.

Anatomic Factors. The anatomic factors to be considered are: (1) Bone deformity, consisting of an extremely small or absent sacral hiatus, marked angulation of the sacrum, partial or complete agenesis of the dorsal wall of the sacrum or septum of bone in the sacral canal; (2) low-lying dura, which results in spinal fluid being obtained on aspiration after insertion of the needle into the sacral canal; (3) dense venous plexus of the sacral canal, which results in aspiration of blood following insertion of the needle and (4) obesity, making palpation of landmarks and administration of caudal anesthesia difficult, but does not preclude the use of the technic.

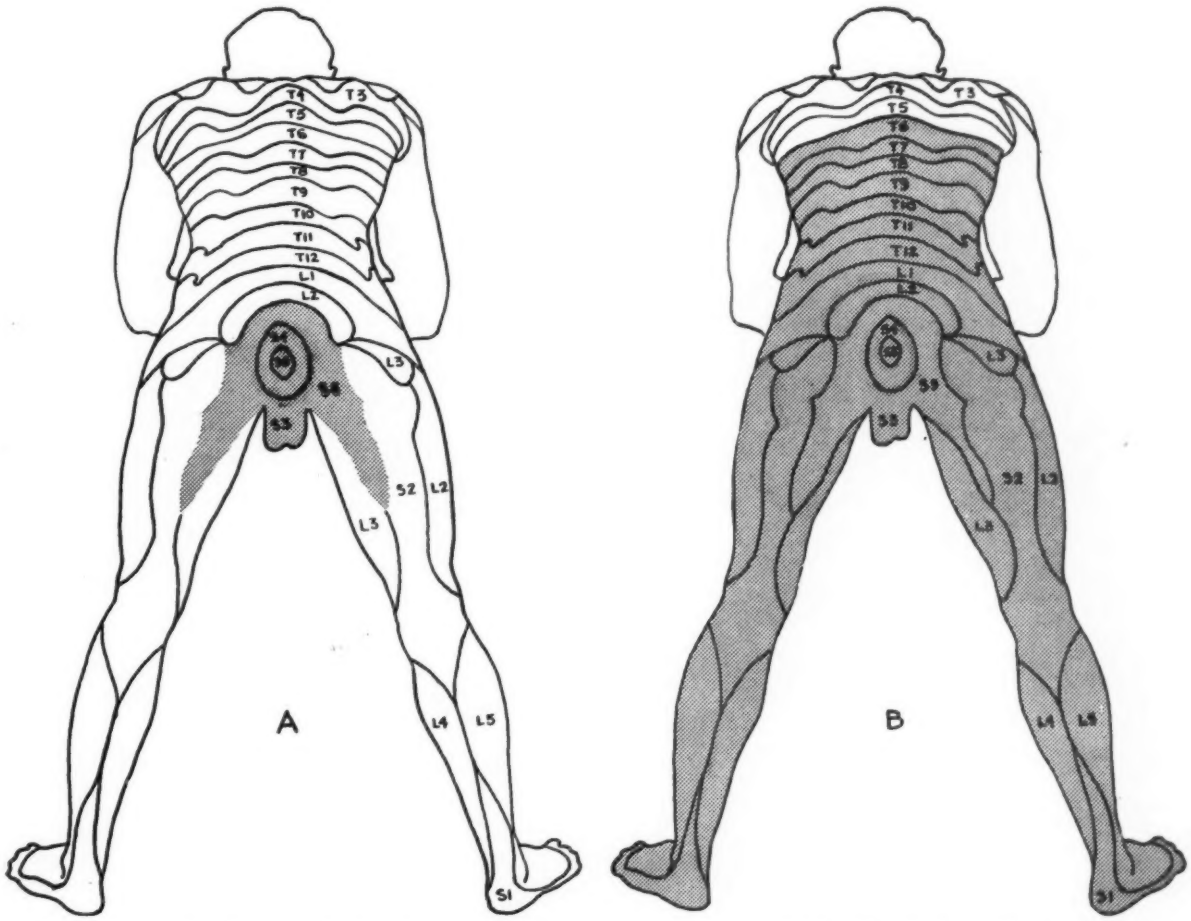


FIG. 3. A, lowest level of anesthesia using 20 cc. of 2 per cent xylocaine; B, highest level of anesthesia using 20 cc. of 2 per cent xylocaine.

Inexperience in the Technic. The technic of inserting the needle into the sacral canal can be readily developed by practice.

Another contraindication to caudal anesthesia is disease of the spinal cord and its meninges.

CAUDAL FAILURES

In compiling this series of one hundred cases, seven individuals were encountered in whom

the method failed on attempting administration through the sacral hiatus. In one a dense venous plexus was present, so that no matter where the tip of the needle was placed, blood was aspirated. Two failures were due to obesity. Attempts to locate the sacral hiatus failed. The

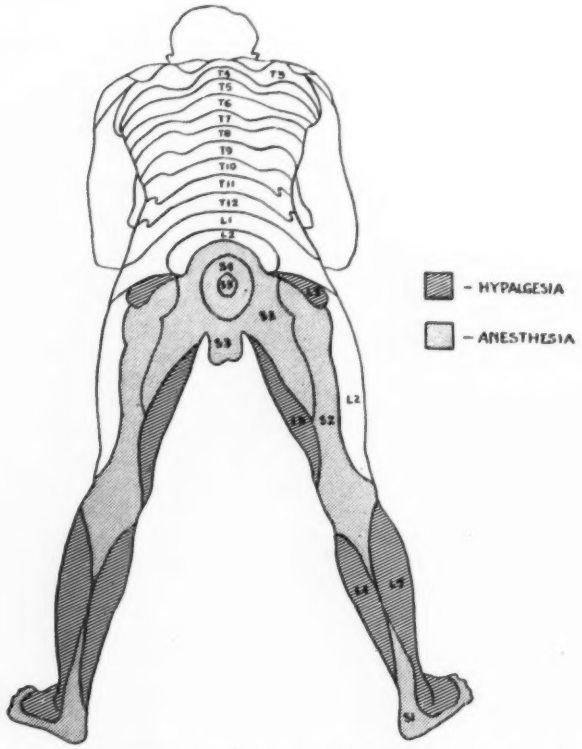


FIG. 4. Average level of anesthesia using 20 cc. of 2 per cent xylocaine.

remaining four failures were due to inexperience in the technic on the part of the anesthesiologist. The anesthetics in this series were administered by ten anesthesiologists with varying familiarity with the technic.

The coccyx, sacrum and sacral hiatus of all seven patients were within normal limits on postoperative x-ray study. Bone deformity played no part in preventing caudal anesthesia in this series. According to the study of Hingson and Edwards, in 5.6 per cent some factor will prevent insertion of the needle through the sacral hiatus into the caudal canal.

In the majority of the cases in which the anesthesiologist encountered difficulty inserting a needle into the sacral hiatus, the deposition of the agent into the sacral canal was accomplished by the insertion of a needle into one of the second sacral posterior foramina. Fifteen cc. of 2 per cent xylocaine hydrochloride were used when the injection was made through the second sacral posterior foramen.

CONCLUSIONS

1. Profound perianal anesthesia of rapid onset and adequate duration for anorectal surgery results from the injection of 10 to 15 cc. of 2 per cent xylocaine hydrochloride into the caudal canal.

2. Hypotension was the most frequent complication encountered. The avoidance of the prone-jacknife position in the elderly, the obese and patients with pulmonary and cardiovascular disease will reduce the incidence of this reaction.

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FISTULA-IN-ANO IN INFANTS

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THE purpose of this article is to bring to the attention of the profession what appear to be the unique characteristics of fistula-in-ano in infants, as compared to fistula-in-ano occurring in adult life. During an interval of five years, 1947 to 1952, seven infants, aged two to sixteen months were seen with fistulas. All of the infants were white males, and in each case the primary sinus and tract proper were in a lateral situation.

This point is worthy of special note since in adults the majority of tracts take origin in crypts closely related to the posterior midline. The reason for the laterally situated fistulas in infants is a matter of speculation. However, it is a well known fact that in infancy the ano-rectal angulation is less acute than in adult life. Thus trauma, by the passage of desiccated stools or diarrhea, is less likely to involve the posterior midline in infants than in adults.

It may also be supposed that crypts in lateral situations are perhaps more prominent in infants than in adults, the relative size diminishing during subsequent growth; and therefore lateral crypts are more likely to receive and retain infective inocula. However

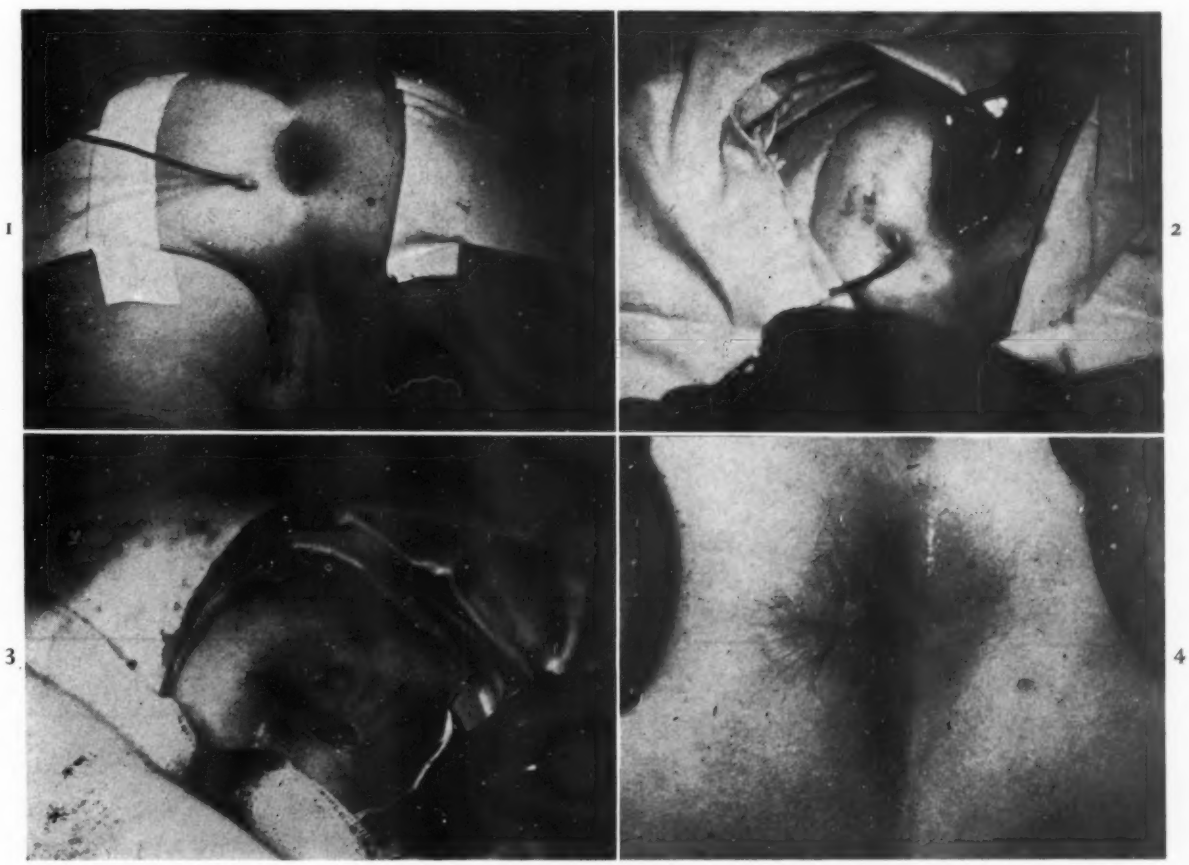

FIG. 1. Probe at the external fistulous opening that is about to rupture. Also shows the position of infant at time of operation. FIG. 2. Probe through the external and internal openings of the fistulous tract. FIG. 3. Fistulotomy with complete saucerization of fistulous tract. FIG. 4. Complete healing of fistulo-in-ano, three weeks postoperatively.

that may be, it is a fact that in seven consecutive cases the involvement was lateral rather than posterior.

A review of the literature discloses that fistulas in infants are rare. Bacon states that in a series of 3,100 cases of abscesses and fistulas only thirty-nine were found in infants. Furthermore, Buie reports that in a ten-year period he encountered 1,801 patients with fistulas, and of these only nine were infants. In a thirty-five-year survey at the Jewish Hospital in Brooklyn, in which 115,000 pediatric patients were seen, 2,700 had some proctologic disorder and only twenty of these were found to have fistula-in-ano.

Gabriel of St. Marks' reports that fistulas are rarely seen in children; but when babies under one year old are affected, they are almost invariably males.

Therefore, the incidence of seven fistulas in infants, during a five-year period in which over 300 abscesses and fistulas were observed, is somewhat unusual. Whether this increase may be attributed to the influx of the newer antibiotics with their concomitant diarrhea is a matter of conjecture.

The etiology and pathogenesis of these fistulas do not differ in any way from the pathogenesis in other age groups. The patients were all normally developed, well nourished white males in whom tuberculosis was excluded by roentgen studies and meticulous physical examinations. As might be anticipated, five of the patients had a history of diarrhea, and in two, constipation had been marked.

In each case the patient presented himself with an abscess, either on the right or left lateral perianal area. Upon incision of the abscess, or upon probing these lateral sinuses, the probe could be passed directly radial emerging from a crypt, also laterally situated. This seems to follow very closely Salmon's law which states that when the external opening of a fistula is within 2 inches of the anal opening and anterior to a transverse line, bisecting the anus, the internal opening is at the pectinate line within the intermuscular septum, opposite the external opening. If on the other hand the external opening is posterior to this line, the internal opening is in the posterior commissure at the pectinate line, usually beneath a crypt. In no instances were the fistulas complex, nor did they involve the pelvirectal or retrorectal spaces. All the lesions were readily amenable to routine fistulotomy and healed quickly. (Figs. 1 to 4.)

SUMMARY

It may be stated that fistulas in infants are found predominately in male patients. They are also invariably in lateral situations, taking origin from a lateral crypt, and presenting a secondary opening in a lateral perianal area. The reasons for this peculiarity are perhaps hypothetical. They may be based on certain local anatomic differences between the adult and the infant, such as greater prominence of the crypts of Morgagni in lateral situations in infants. The fistulas are not of tuberculous origin. They are predominantly associated with a preceding diarrhea and are generally uncomplicated, yielding to simple fistulotomy.

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